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Electrical World

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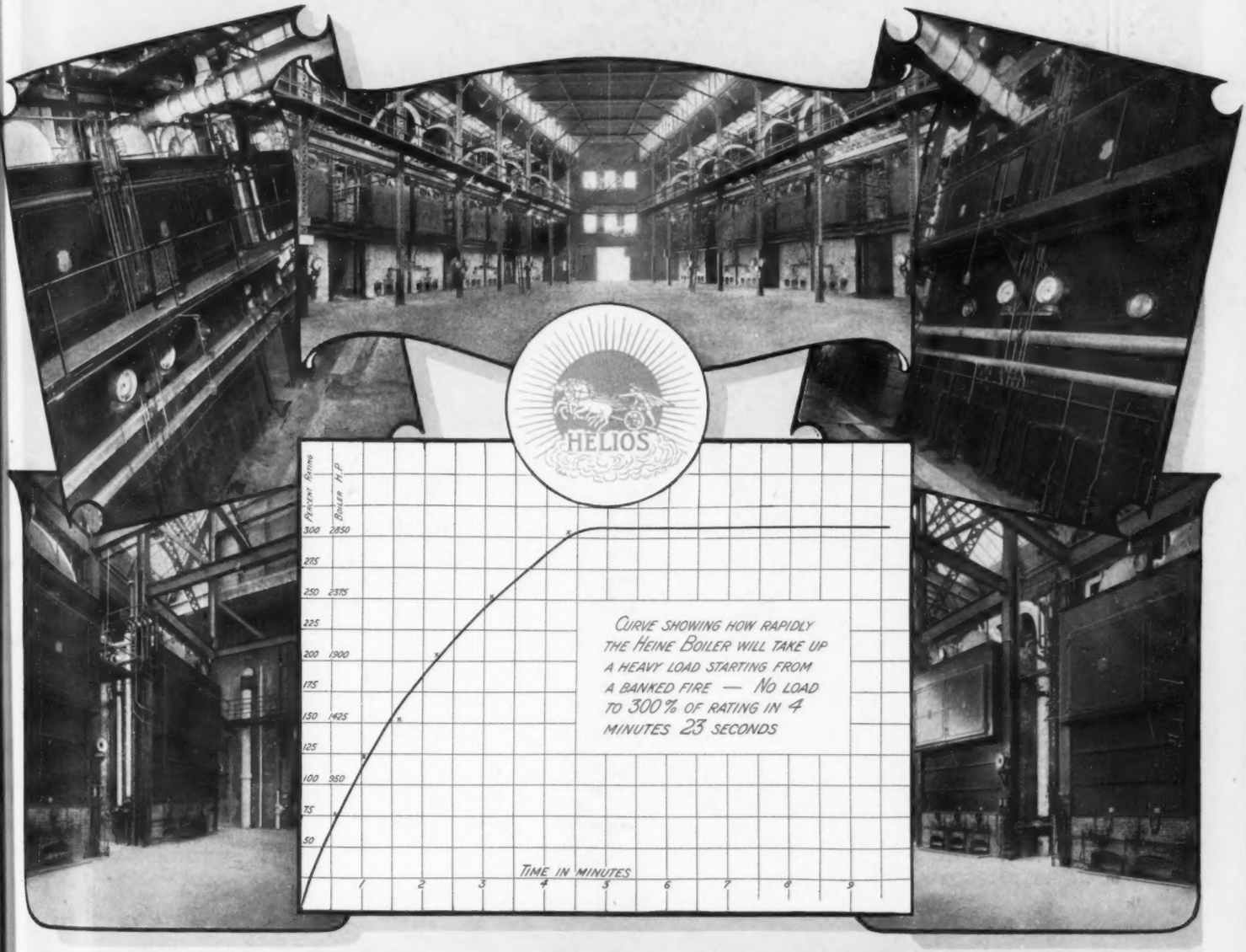

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Electrical World

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New York, Saturday, May 27, 1922

Volume 79 *Number* 21

For Greater Expectations

GRADUALLY the thought is sinking in that the great movement for business development, formally launched at the Atlantic City convention, must set new standards for electrical men in commercial plans and policies. Here is a project which embraces all branches of the industry, but in the end the individual must do the work and it is a bigger work than he has ever taken on before.

Any great success can only be made possible by a broader vision, a larger expectation and a more impulsive effort than we have been accustomed to in recent years.

ONE day last November, for example, in an Eastern city, we talked to the manager of a central-station electric shop. Masses of small reflector-type radiators were on display. The winter campaign was on. He was enthusiastic. Ten men were ringing doorbells on commission and together selling 400 radiators a month. They were "doing a fine business," he said.

But—consider this. The radiator drive could last, we'll say, four months, and make some 1,600 sales. Yet 450,000 people live in that town, and there are 30,000 households using electric service. In every one of them a radiator could have been sold unless that home possessed one or two already. Therefore 100 men could have made 4,000 sales each month as easily and profitably as ten could make 400. And 16,000 radiators could have been added to the load in that one town last winter if this man had had a vision of the greatness of his opportunity.

We are so new at all of this. We think so much in terms of former years. Yet in 1921 alone 1,100,000 new residence consumers came into our market in America. And it is estimated that 3,500,000 more new and old houses will be wired within the next five years. There are already 7,500,000 connected homes to sell to in the land. Each one of them needs and wants everything electrical. And still we are content to sell by tens where we could sell by hundreds.

Central-station sales departments, therefore, must be re-established and the local co-operative plan conceived upon a bigger basis than we have ever sensed before. And there must be also broader vision, larger expectation and a will to work—not in the war-time way—but with a more intense creative spirit and constructive force.

TO DO the job for which the industry is organizing will need an ample and well-oiled machinery, setting up a working balance of all the classes of electrical men. But more even than organization it needs inspiration and a recognition by the individual of the scope of the steadily expanding common opportunity.

Frank Baldwin Jewett

President-elect of the A. I. E. E., who for the past fifteen years has been actively associated with all important telephone developments.

ALTHOUGH just reaching the prime of life, Frank B. Jewett, president-elect of the American Institute of Electrical Engineers, has long since been recognized both at home and abroad as one of the foremost telephone engineers of our time. With all of the remarkable developments in the telephone art which have taken place in the last fifteen years, and which include the establishment of the transcontinental telephone line and talking for the first time by radio across the Atlantic, Dr. Jewett has been actively associated. Because of his scientific skill and administrative abilities his contributions to these and many other notable achievements have been of the first order.

He was born in 1879 at Pasadena, Cal. In 1898 he was graduated from the Throop Polytechnic Institute, now the California Institute of Technology. From the University of Chicago, where he spent some years as research assistant to Prof. A. A. Michelson, he received the degree of Ph.D. Later he was instructor in physics and electrical engineering at the Massachusetts Institute of Technology, and in 1904 he joined the staff of the American Telephone & Telegraph Company. In this position he worked in a field in which his brilliant attainments and fundamental scientific training qualified him admirably for the practical engineering work and scientific development and research which he was called upon to do.

In 1912 Dr. Jewett became assistant chief engineer of the Western Electric Company, and in 1916 he was made chief engineer having charge of the research laboratories of that company, which carry out the experimental work for the Bell Telephone System. Under his charge also was all the engineering work required in connection with the manufacturing activities of the Western Electric Company. He is now vice-president of the Western Electric Company, and his duties have been extended to include the supervision of all the manufacturing operations of that company in America, together with the direction of its sales and the distribution of its manufactured product.

At the outbreak of the war Dr. Jewett was commissioned as major in the Signal Corps and had charge of the development of numerous scientific devices for the use of that branch of the service. Prominent among these was the radio telephone for use in connection with aircraft. He served as a member of the anti-submarine board of the United States Navy and took a notable part in the development of methods and apparatus for combating the submarine activities of the enemy. He was promoted to the grade of lieutenant-colonel, and for his service in the army and his other war activities he received from the United States government the distinguished service medal.

Dr. Jewett is the author of numerous scientific and engineering papers and is one of the foremost among those who have contributed largely to advance electrical engineering to its present high standing among the learned professions. He is a director of the Western Electric Company, Inc., and of the International Western Electric Company, Inc.; vice-president of the Manufacturers' Junction Railway and past-president of the New York Telephone Society. He is a member of numerous scientific societies, including the National Academy of Sciences, the National Research Council, the American Physical Society and the American Association for the Advancement of Science; a trustee of the Engineering Foundation Board and vice-chairman of the Engineering Foundation.

Editorial Comment

Electrical World, May 27, 1922

Volume 79 Number 21

Prosperity Again with Us

BUSINESS in electrical materials and supplies is on the upgrade—not feverishly as in 1919, but as the honest outcome of good hard sales effort. Billings are for the most part far in excess of those in 1913 and 1914, and as a result employment in electrical manufacturing plants is increasing. Much of the reckless price cutting of a few months ago has disappeared, and in a few lines prices are actually advancing.

Better still, however, is the outlook. The electric light and power companies, the largest single market for electrical products, are ordering quantities of generating equipment, transformers and line material. Prime-mover orders are again piling up. There is hardly a large city in the country that is not installing, or that has not placed contracts for, prime movers. It was shown in the issue of May 13 that at least $400,000,000 will be spent in 1922 by new and existing companies. These new units, substations and lines must all be loaded. The investment must be put on a paying basis as soon as possible. This means the purchase of energy-using equipment—wires, transformers, lamps, meters, electrical supplies, etc.

The other important market—the industrial market—is beginning to pick up as the result of generally better conditions. Many factory heads are anticipating more strenuous times by putting their motor equipment in order. The mining industry, with the exception of the coal mines, and the oil industry are getting into stride. One of the most promising markets, however, is that afforded by the electrification of railroad lines and terminals. Millions will be spent in equipping the Chicago terminal of the Illinois Central. An announcement that one or more of the large Eastern roads are ready to start main-line electrification may be given out any day. Other roads are known to be figuring on the cost.

Stimulating these demands will be the business development campaign of the electrical industry fostered by the National Electric Light Association. Just in proportion to the effort put forth locally will this movement result in supply sales.

The Voice of That Small Group

IN A GREAT auditorium a large audience was gathered. The ventilation was bad. There was much grumbling. Suddenly eight men in an upper box began to yell in unison: "We want air!" The manager heard, fans were started, ventilators were opened. Such is the power of the organized co-operation of a few men. It was not necessary for everybody in the theater to shout, but the voices of one small group working together accomplished what individuals could not.

This is the same kind of opportunity that awaits the organized effort of the small group of electrical men in every community in the land. The message of electricity must be carried out to all the people. Individual murmurings and individual eagerness are not enough. The voice of that small group must be raised in unison if the common purpose is to be achieved and if our industry is to forge ahead with the full recognition that will only come when it is won.

Satisfied Curiosity Begets Confidence

A FEW conspicuous examples remain of the type of public utility official who objects to releasing information on plant economy and operating expenses, fearing that some politician will use part of it against the company. No fear is expressed that the data will react against the company if used in their entirety. The reasons for making such data public are so obvious that the logical thing would be to call on the opponents of publicity to tell why, in their opinion, they should *not* be made public. A tremendous amount of effort has been expended to educate the public to the facts that underlie the operation of public utilities, to tell it that the utility is established for the purpose of rendering service, to encourage it to consider the utility as a thing of intimate direct concern with itself, and to induce it to sustain the utility by investing in its securities.

A particular example of the fallacy of unwillingness to publish pertinent facts arose recently in California. In this case it was urgently requested by officials of several power companies that data of the operating results of their companies be not made public, for the reason that the advocates of the California water and power act might seize upon them and use them to the disadvantage of the existing utilities. For three reasons these requests seemed puerile: The operations of the California companies will stand comparison with those of any plants operating under similar conditions; the figures could all have been obtained by appeal to the California Railroad Commission, with which they are filed, and, most pertinent of all, the proponents of this act do not have recourse to either facts or figures in their statements but rely on imaginative "spellbinding."

Of the principal factors that sustain the life of the utility that of public confidence is one of the greatest. Curiosity satisfied begets confidence. If the facts regarding a utility are concealed or shrouded in mystery, the consumers and the public will become suspicious and clamor for an investigation. How often we have seen such investigations begun by public officials, only to have them abruptly stopped when the facts became known! There is nothing in the operation of a central-station company that needs to be concealed, and the sooner the few remaining objectors to broadcast dissemination of utility expenses are converted, the better it will be for the industry as a whole.

Consideration of Human Element Essential to Best Public Relations

MUCH of the public-relations effort being expended in the utility field is wasted because the developments in the field are treated as having worth without reference to their human environment. Human beings have lived in the world for untold centuries. At the bottom human nature is the same today as it has always been. It has its likes and dislikes, its fears and hopes. Out of these all development springs because they are the elemental forces that drive humanity to do things that minister to physical needs and the real or fancied wants of the individual. If public relations work of any character is to be a success, it must be based on a clear recognition of this fact and the industry must be presented as a factor in community development. Mere claims that the industry must have money to give service are utter folly. Efforts to show the place of the industry in the scheme of community welfare, and that to assume this place, which none other can fill, it must have financial support and a fair deal as well as give the public a fair deal, are only common sense.

Astonishing Claims for New Lead Battery

A NEW lead storage battery for which astonishing claims are made is announced from England. It is the lead-hydrate battery, first proposed a number of years ago and now appearing in developed form as a commercial offering. It differs from other present well-known types of lead battery only in the active material, which, however, permits the use of fewer and thicker plates.

Exemption from practically all of the troubles to which the commonly used lead cells are liable is claimed for the new cell. Sulphation is absent because the active material can be obtained in purer form. Buckling and disintegration are avoided because the volume of the active material does not vary under any conditions of charge or discharge. High capacity at low rate is obtained because more active material can be used and because it is very porous, permitting the electrolyte to penetrate freely. As a consequence, for a given weight of cell the plates can be made thicker and fewer in number, improving the mechanical structure. Claims made for the battery are a capacity 300 to 800 per cent greater than for any other; that it is rechargeable at any rate, reducing the charging interval to as little as fifteen minutes; a longer life than any other battery, and the possibility of standing for an indefinite time in any state of charge or discharge without deterioration. Some interesting test data under severe demand conditions are given in a recent number of the London *Electrical Review*. It is also asserted that a large company is being formed for the manufacture of the cell in this country.

In the light of the character and authority of the evidence presented, it is perhaps unwise to express skepticism. It must be remembered, however, that it is possible to construct a battery for exceedingly large values of capacity if provision does not have to be made for long life. Moreover, extravagant claims which have not been substantiated have often been made for batteries of new design. While the present battery does not appear to be in the latter class, conservative engineers will await comparative tests, as regards both capacity and life per unit of weight, between this battery and those of reliable types now in use. The announcement referred to is noticeably silent on the question of such comparative tests.

Co-ordinating Plant Operation for Highest System Economy

THE operation of a complex system fed by hydro-electric and steam plants so as to attain maximum economy is a task of details rather than fixed principles. The most that one can do in an orderly attack upon the problem is to correlate his facts and be guided by them. How this is done in the great Southern California Edison system was explained in our May 13 issue by J. W. Andree.

The first step is to know the actual operating conditions of each plant and the run of demand on the whole. Then one may divide the hydro-electric plants broadly into two classes—the base-load plants which must keep running to let through water for irrigation and those which can store water, either day by day or for long periods, over the whole season. The plants giving daily storage can advantageously be worked for carrying daily peaks or held in reserve up to the time when further storage would waste water.

It is a fundamental of hydro-electric operation that water never should run off save through the wheels if this can be avoided. Where several plants on the same stream are concerned the storage can be utilized successively so as to make the best use of the water. Then if the load rises beyond the generating capacity of the hydro-electric plants the most economical steam plant is put into service, followed by the next best and so on; meanwhile, if it is flood season, the great reservoir for carrying through the dry season is filling, never drawn upon unless unavoidable. Usually it is cheaper to use steam to permit storage during times of good flow than to be caught with heavy demand for it later in the season.

It takes no small skill in finesse to work a complicated system like this in an orderly and efficient manner, but close study of the data enables it to be done as Mr. Andree indicates. A study of his system in connection with the maps will give a very clear idea of the general methods which must govern a particularly detailed knowledge of load and flow.

Corona Discharge as a Relief to Line Surges

THE question of the value of lightning arresters on high-voltage lines has been often discussed and received new comment in the report of the electrical apparatus committee of the National Electric Light Association last week. Replies which have been received from a questionnaire indicate a wide opinion that bus arresters ordinarily furnish sufficient protection to the equipment connected close to the bus, and that arresters are not required for individual lines connecting with the bus. It is claimed that the corona effect of a 120-kv. line is an effective lightning arrester. Some engineers seem to think that even the bus arrester is unnecessary, it being felt that the maintenance of arresters of this high voltage amounts to more than the damage experienced by good equipment.

particularly if a little more money is put into the insulation. Arresters have been omitted entirely from some systems in the West ranging from 60 kv. to 110 kv. It is to be regretted that data on this subject are not more numerous. Experimental observation on some of the existing lines would be of very great value.

The use of the corona as a protective feature requires mechanical design for corona discharge at a voltage only slightly in excess of normal operating voltage. Few existing lines meet this condition. Most of them are designed for corona voltage far in excess of operating voltage in order to avoid energy losses. It should be noted, however, that it is possible to equip an existing line with discharge points which may be so designed as to give a corona discharge curve practically equivalent to that corresponding to the true corona discharge. Some interesting experiences on a line so equipped have been reported from Germany, and they show a decided protective value for the device. The corona is undoubtedly an ideal form of lightning protection, in that each foot of line is its own arrester. There is, however, still the important quantitative question—that is, whether the volume of corona discharge is sufficient to relieve the maximum disturbances that arise.

Co-operation in Joint-Pole Occupancy

UPON a clear understanding of mutual privileges and responsibilities depends in large measure the successful operation of a joint-pole agreement. Given this understanding, it only remains for the proper representatives of the utility companies concerned to carry it out with the spirit of mutual helpfulness and a reasonable regard for their principals' interests in order to secure a lasting and satisfactory relationship. In the May 13 issue Fred H. Smith reviewed the more important phases of a working agreement for joint-pole use and ownership, drawing from the experience of the Worcester (Mass.) Electric Light Company certain points of general application.

Readers of Mr. Smith's article will be impressed with the importance of making a broad survey of the problem of joint occupancy before entering into an agreement as to procedure and the allocation of expense. It is obvious that such a problem can be handled in more than one way. Occupancy may involve mere rental or attachment rights, or it may be defined to include actual joint or multiple ownership of overhead structures. The joint-ownership scheme as used at Worcester appears to give admirable results, notwithstanding the fact that the number of attachments varies widely over different sections of the city. In this case there appears to be a mutual recognition by the central-station and telephone companies that joint ownership over a territory "averages up" well for the parties concerned, and so we find the understanding between the utilities singularly free from complications, either legal or practical.

Advance recognition of the part each company may play in obtaining pole locations, the terms upon which unoccupied cross-arms may be used, the standards of spacing and allocation of arms desirable, and the responsibility for maintenance of poles and guys, must all be gone over in laying out a fair and workable scheme of inter-utility pole service. Conditions vary so widely in different localities, as do the forms of utility organization, that the best practice in settling among companies the value of pole occupancy and the costs of maintenance is likely to vary as well. These offer little trouble if the problem is approached in the spirit of friendly co-operation.

Importance of Caution in Calculating Temperature Rise on Intermittent Duty

DETERMINATION of the rise of temperature of standard machines under constant conditions as to load and surroundings offers no difficulty. However, with variations of ambient temperatures and load it is not always possible to state or determine the temperature reached. Many types of industrial motors work on intermittent duty, and if the cycle is regular and uniform, estimates of final temperatures satisfactory for use in the selection of motors may often be made. The root mean square of the current cycle is frequently used for this purpose, but may lead to serious error if the peak load of the cycle is of relatively long duration.

An approximate method for determining the temperature rise of a machine or any part of it, on any given short-time load, say of twenty minutes' duration, is given in another section of this issue by G. E. Luke. It depends on the assumption that the heat losses in any part of the machine are uniformly distributed by conduction through that part, and on certain constants connecting the losses with the final temperature rises on continuous duty. Naturally these constants vary with different machines and speeds, and the article gives the values of these constants for several different types of machine at various speeds. The agreement of the results of tests on several machines with the values computed from the relatively simple formula proposed indicate that the method may prove very useful in the field mentioned.

It should be remembered that the method does not take account of the "hot spot" and should be used with caution in estimating the results of heavy short-time overloads. A more extensive paper by the same author on the heating of railway motors, in which the derivation of the formula used in the present paper is given, was presented recently before the American Institute of Electrical Engineers.

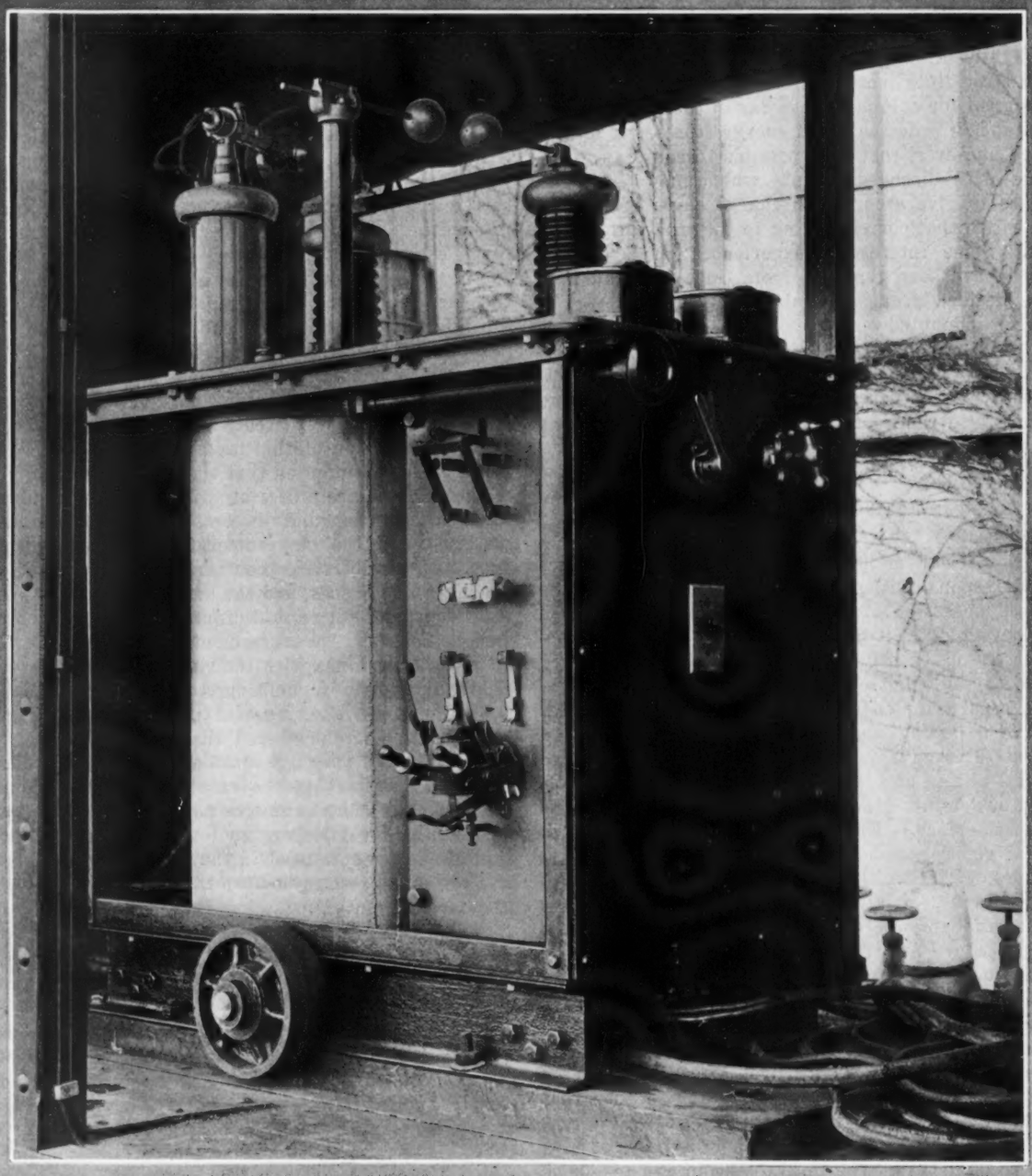
A Source of Help that Should Not Be Ignored

SMALL-SIZED central-station companies have often complained that they can find nothing in the practices of large companies which they can apply to their conditions. Applied in exactly the same way that the larger companies employ them, the practices of the latter may be worthless to small companies, but certain fundamental principles are always involved which are applicable to all. It remains for the smaller companies to find them.

Furthermore, small companies must realize that large companies are sometimes the only ones financially able and adequately equipped to make investigations of a pioneering nature. Hence they are many times the only source of information on new ideas and methods.

Remembering that the problems of all central stations are essentially the same except in magnitude, every small company will do well to study the methods and practices of larger ones with the idea of adapting them to its own conditions. The company that does so will be surprised at the fund of information available.

Kenotron Should Prove Attractive for Testing High-Voltage Cable if Shortcomings Are Eliminated



A DIRECT-CURRENT method of testing long high-voltage lines is desirable as the kilovolt-ampere capacity required for testing with alternating current at double voltage amounts to very large figures. Recognizing this condition, several large central-station companies have been experimenting with the kenotron for this purpose. Although the experience to date has not been entirely satisfactory, it is believed that the difficulties and shortcomings of the present devices will soon be eliminated. To hasten this accomplishment, however, it will be necessary for every user to compile a list of service requirements and make a careful record of shortcomings of the kenotron from this viewpoint. With this information made available to the manufacturers, they should be able to meet the requirements of operating companies.

Investigations are now in progress to determine the proper ratio between direct-current volts and alternating-current volts in order to subject the cables to the same dielectric stress. The underground systems committee of the N. E. L. A. is expected to continue the investigation of this and other phases of the subject. It will help greatly if companies which are equipped to conduct investigations will contribute their experience.

Factors that Determine Sign Legibility

Distance at Which Electrical Announcements Can Be Read May Be Diminished by Brightness of Lamps—Atmospheric Absorption Compensates for Brightness—Mathematical Relation of Factors as Determined by Research

By C. A. ATHERTON
Engineering Department, National Lamp Works of General Electric Company

TO INCREASE the attracting power of electric signs, especially in the better-lighted districts, lamps of higher wattage have become popular. This has usually resulted in increasing the distance over which the sign is effective. Sometimes, however, such a sign has not been legible as far as another similar in all respects but with lamps of lower wattage. This condition has confused the question of the maximum distance at which legibility will be assumed. Does an increase in the brightness of lamps make a sign legible for a greater or for a less distance? The answer may be either way according to the relative effects of the following principal factors: (1) Dimensions of the letters; (2) tip candlepower of the lamps; (3) color of light; (4) brightness of background and surroundings; (5) size of the sign; (6) atmospheric transparency; (7) grouping and choice of letters; (8) familiarity with the words, phrases or publicity pattern; (9) location of the sign.

Letter Dimensions.—There is a theoretical maximum legibility distance beyond which a sign cannot be read. This is attained only when the determining factors are in ideal relation with one another. If details lie closer together than one minute of arc,* their images strike the same unit of the retina, which is stimulated as

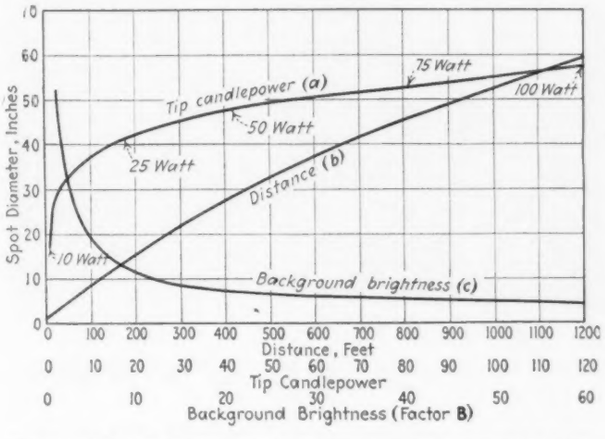


FIG. 1—APPARENT SIZE OF LIGHT SPOT FROM A SINGLE LAMP

(a) Distance = 1,000 ft., field dark ($B = 1$), tip candlepower varying. (b) Tip candlepower = 81 (factor $A = 12$), field dark ($B = 1$), distance varying. (c) Tip candlepower = 81, (factor $A = 12$), distance = 1,000 ft.; background brightness varying.

though only one image fell upon it. The maximum legibility distance theoretically possible is directly proportional to the letter dimensions. All other factors, notably tip candle power, tend to decrease this distance.

*The minimum angle of visual acuity for normal eyes lies somewhere between 45 seconds and 55 seconds of arc. One minute is used as a convenient standard which allows low legibility at the assumed dividing line. In this respect and in others eyes vary greatly; therefore for individuals the maximum legibility distance as calculated for the average eye may be increased or decreased considerably.

Tip Candlepower.—An exposed incandescent filament seen against a dark field will, owing to irradiation, appear much larger than it is. As the observer moves away the spot of light does not diminish in size as fast as less bright objects do. Its apparent size as compared with less bright objects actually increases. It may first appear one-third as large as the glass bulb; soon it is two-thirds; then it fills the bulb, and as the observer moves away the glass disappears and the spot apparently continues to swell. The relations between spot size, distance, tip candlepower and background brightness under various conditions of weather and atmosphere and for many different pairs of eyes have been determined in a series of investigations for a large range of lamp sizes. The relation between apparent spot size and distance is shown below:

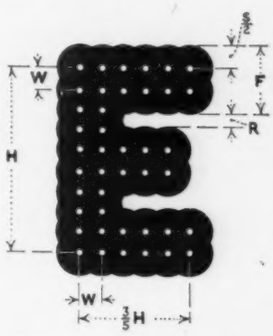


FIG. 2—BASIS FOR ESTABLISHING LEGIBILITY OF ALL OTHER LETTERS

$$S = \frac{D}{A + 0.0083D} + 0.0035D, \qquad (1)$$

where S is the diameter in inches of the apparent spot of light measured in the plane of the light source, D is the distance to the observer in feet, and A is an inverse function (see the table) of the tip candlepower of the light source.

In Fig. 1 the variation of spot size with distance for a popular sign lamp (seen against a dark field), as calculated from equation (1), is shown in curve b. Another curve (a) in the same figure shows the spot size, at a fixed distance, of the various lamps commonly used for electric sign purposes.

Color of Light.—The color of the light used affects the legibility distance of electric signs, but since color is used to obtain greater attracting power and better artistic and spectacular effects, and since, as it is usually applied, the question of maximum legibility distance becomes of secondary importance the subject will not be discussed here.

Background Brightness and Size of Sign.—The distance and tip-candlepower curves of Fig. 1 show spot sizes of single light sources when seen against a dark field. Where other lights are near by, as is the case in an electric sign, the spot size is greatly reduced. The relationship between spot size for one lamp and surrounding or backgrounded brightness is shown in Fig. 1.

Equation (1), which is true for one lamp with no other lights about, has to be modified before it can be applied to practical sign design to take into consideration the brightness of the surrounding field. The effect

in the equation is that of increasing the value of the constant A as shown in equation (2):

$$S = \frac{D}{AB + 0.0083D} + 0.0035D \qquad (2)$$

B depends on the light that enters the eye and the angular distance of each part of this light from the

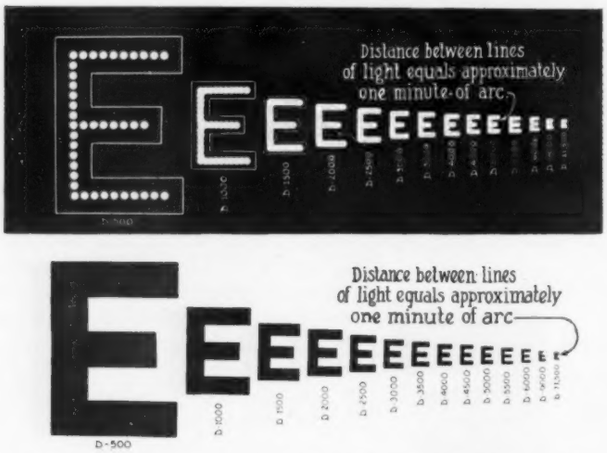


FIG. 3—EFFECT OF IRRADIATION IN REDUCING LEGIBILITY OF HIGH-WATTAGE ELECTRIC SIGNS ON CLEAR NIGHTS

The upper series of letters shows the appearance of an illuminated electric sign letter of various distances (H = 10 ft., fifteen 75-watt clear lamps in vertical stroke). The lower series shows the same letters as seen by daylight when the effect of irradiation is negligible. At 5,000 ft. for the lighted letter and at 11,500 ft. for the daylight letter, the space between the strokes is about one minute of arc and the letter is at the limit of legibility. The true effect from the illustration can be best obtained by holding the page at such a distance that the smallest E in the lower row is just legible.

lamp. For the conditions under which each of the more popular lamps is ordinarily used the values of AB given in the table may be taken as representative.

With equation (2) it is possible to reconstruct the exact appearance of any clear lamp sign at any distance, under conditions of clear atmosphere and normal eyes. Fig. 3 shows a 10-ft. (3-m.) Gothic letter E with fifteen 75-watt lamps in the vertical stroke as seen at various distances. Linear dimensions are converted into angles to make the appearance more natural. For comparative purposes the appearance of the same letter seen by daylight, assuming no effect of irradiation, is shown. Between 2,000 ft. (610 m.) and 2,500 ft. (760 m.) the spot size is approximately equal to the trough width, and at 5,000 ft. (1,520 m.) the separation of the strokes is less than one minute of arc and the two strokes are indistinguishable to normal eyes. Not until the observer gets to 11,500 ft. (3,500 m.) does the letter cease to be legible by daylight.

Any letter will cease to be legible at a distance greater than that at which the spaces between the lines of light subtend at the observer's eye an angle of one minute of arc as shown in Fig. 2. For convenience of calculation, a Gothic letter E, whose width is three-fifths its height, is taken as a base and the legibility

VALUES OF CONSTANTS FOR EQUATIONS (1) AND (2)

Lamp Size, Watts		Dark Districts, Small Signs, 100 Lamps		Bright Districts, Large Signs, 2,000 Lamps	
	A	B	AB	B	AB
10	34	3	102	20	680
25	18	5	90	35	630
50	14	5	70	35	490
75	12	5	60	35	420
100	10	5	50	35	350

of other letters relative to an E is determined. Gothic letters are the most commonly used in electric signs. For the letter E the letter height, H, measured on the center lines of the outside rows of lamps, is given by $H = 3F + 2R - S$, where F is the width of the line of light, R is the width of the space between two lines of light† and S is the diameter of the apparent spot of light. In the case of a single line of lamps F is equal to the diameter of the spots of light which are its elements, and in the case of two or more lines of lamps $F = W + S$, in which W is the width of the stroke of the letters measured from the center lines of the outside rows of lamps. Where a single line of lamps only is used W is equal to zero. Where the sign is seen at the distance of maximum legibility, by definition, R is equal to one minute of arc, or expressed in terms of distance D is: $R = 0.0035D$. Therefore at the limiting legible distance:

$$H = 3W + \frac{2D}{AB + 0.0083D} + 0.01D \qquad (3)$$

Assuming values of B based upon average sizes of signs and average street illumination, the maximum legibility distances for a Gothic letter E with single rows of lamps calculated from equation (3)† for 10-watt and 75-watt lamps are as shown in Fig. 4.

Atmospheric Transparency.—Dust, smoke and fog, which reduce atmospheric transparency, first increase maximum legibility distance. By absorbing part of the light the tip candlepower is apparently lowered. In equations (2) and (3) this is equivalent to increasing

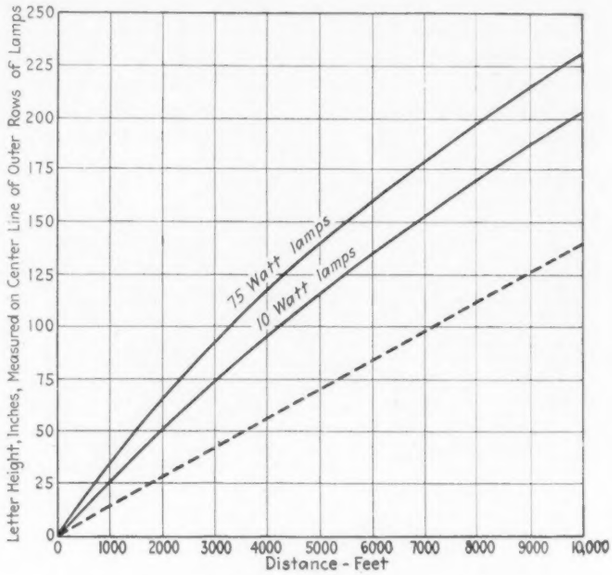


FIG. 4—MAXIMUM LEGIBILITY DISTANCE OF SIGNS OF AVERAGE NUMBER OF LETTERS

Based on average street illumination and clear air when seen by normal eyes and when the determining letter is a Gothic E or its equivalent. The dotted line shows a theoretical maximum distance ordinarily unattainable even under the best conditions encountered in service.

the constant A. Illuminating the dust or smoke particles creates a brighter background and is equivalent to increasing the constant B and legibility distance.

This increase, as the atmosphere changes from clear to hazy, never brings the actual legibility distance up to the theoretical maximum. As the haze increases

†AB values assumed are 110 for the 10-watt lamp letter signs and 70 for the 75-watt lamps.

and the lines of light become apparently thinner they become dimmer. At some point, dependent largely on street illumination, the sign becomes indistinguishable.

Atmospheric absorption reduces the maximum distance at which the sign, as a spot of light, can be seen. The greater the density, the shorter the distance. The variation of maximum legibility and maximum visability distances with atmospheric transparency is shown in Fig. 6. It is interesting to note that for all conditions of increasingly heavy atmosphere beyond that density which has entirely eliminated the effect of irradiation the maximum legibility distance coincides with the greatest distance at which a sign can be seen. For such conditions of dense atmospheres lamps of high tip candlepower are much more effective than lamps of low tip candlepower. In clear atmosphere greater legibility distances can be obtained with lamps of low tip candlepower.

The extent to which the maximum legibility distance may be reduced by atmospheric absorption is best illustrated by an example. On Michigan Avenue in Chicago a large sign advertises Fisk tires. A long open stretch lies before it. The letters are of the solid massed-lamp type. In the word "Fisk" the over-all height of the letters is 275 in. (7 m.) and the width of the strokes—W in equation (3)—is 40 in. (1 m.). There are 1,250 10-watt lamps in the large letters, and street illumination is comparatively high. A fair value of AB is 300. The maximum legibility distance on a clear night is obtained from equation (3):

$$275 = 120 + \frac{2D}{-300 + 0.0083D} + 0.01D.$$

The determining letter is F, which can be read 1.04 times as far as the letter E, upon which the equation is based; therefore,

$$D = 1.04 \times 10{,}100 = 10{,}500 \text{ ft.}$$

By actual trial on a night when there was no fog and the weather was fair, but with low atmospheric transparency, the sign seemed to fade into a semi-luminous haze at 5,800 ft. (1,760 m.). Absorption had decreased maximum legibility distance to about 55 per cent of what it would have been on the clearest possible night. In this sign and under these conditions both maximum legibility distance and distance of effectiveness would be increased by using lamps of higher wattage. On nights, when atmospheric absorption would just eliminate irradiation, the sign might have been legible up to 20,000 ft. (6,000 m.) and recognized far beyond.

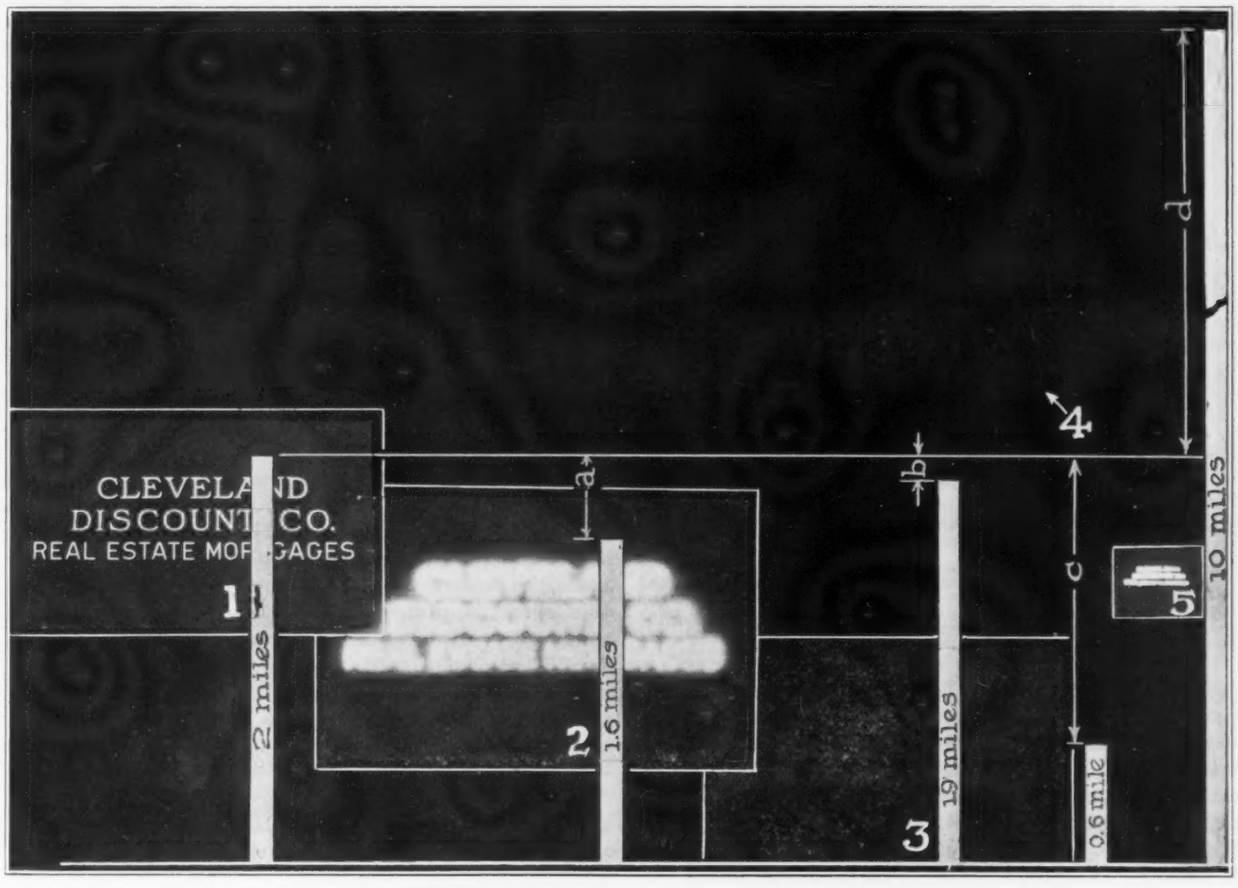


FIG. 5—APPEARANCE OF A LARGE SIGN AT VARIOUS DISTANCES

Under different conditions of atmosphere some of the positions may be beyond the maximum distance of legibility. This illustration should be viewed at such a distance that No. 1 is just legible. 1. Theoretical maximum (no effect of irradiation or atmospheric absorption). 2. Clear air (irradiation effect at a maximum). 3. Light haze (irradiation just balanced by haze). 4. Heavy haze (sign not visible beyond limit of legibility). 5. Clear air (sign recognized by its shape and location).

Letters Used.—The maximum legibility distance depends also upon the choice of letters. Some letters are more easily read than others. A sign in Chicago reading "Apollo" is legible at astonishing distances. It is found that after P has become indistinguishable from F, or O from C, the A and the two L's are clear enough to make it easy to guess the rest. If the lettering had contained all B's and E's and G's, etc., the maximum

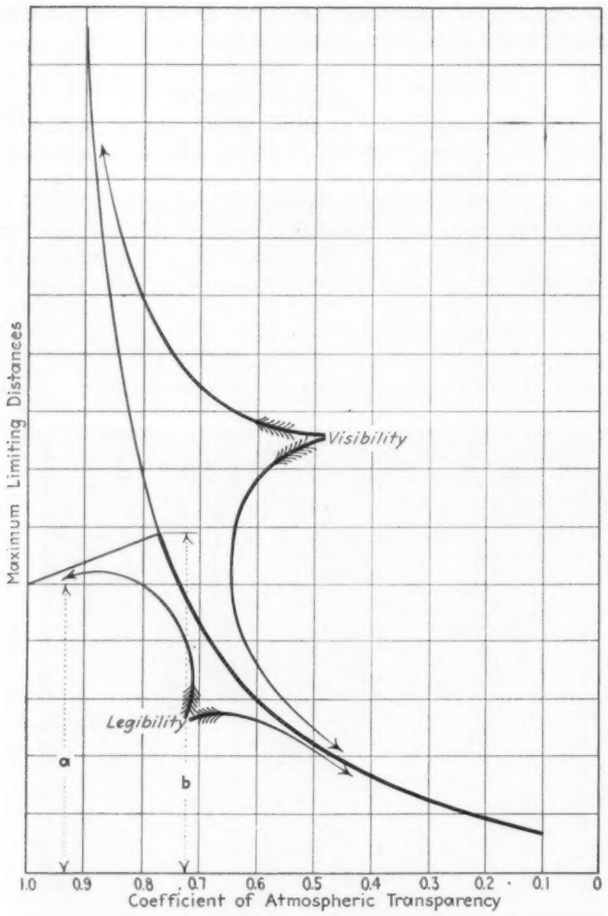


FIG. 6—EFFECT OF ATMOSPHERIC TRANSPARENCY ON VISIBILITY AND LEGIBILITY DISTANCE

a = maximum legibility distance for clear air. $b \div A$ = theoretical maximum legibility distance which might be attained when a certain atmospheric absorption so reduced the apparent brightness of the sign as exactly to neutralize all effect of irradiation, but which is usually unattainable because of street illumination.

legibility distance might have been decreased 30 per cent or more. The relative legibility of an alphabet of Gothic letters of the same height is as follows:‡ The letter B is most difficult, because it may look like an E or a D or an R or many others. I, A, J, L, etc., are the easiest to read because the shape of each is not like any other one. At great distances an A looks like an isosceles triangle, a J like a right triangle with the hypotenuse to the left, etc. The larger the percentage of these more legible letters in a sign, the greater its maximum legibility distance.

B	0.85	F	1.04	X	1.08
H	0.92	P	1.04	W	1.13
G	0.92	Y	1.04	M	1.13
S	0.95	O	1.06	T	1.15
R	0.97	Q	1.06	L	1.19
E	1.00	K	1.06	J	1.21
N	1.00	C	1.07	A	1.30
Z	1.01	U	1.07	I	1.41
D	1.03	V	1.08		

Distinctive Pattern.—Another phase is the increased maximum legibility distance due to distinctive patterns. The script of a Cadillac motor car sign is recognizable at distances many times greater than the relatively short ones where the few necessary separate letters become clear enough for the whole sign to be read. Although in the strict sense of the word a sign is not legible beyond that distance at which it can be read by one who never has seen its characteristic pattern, many signs far beyond this distance are distinguished in the general mass of lights by their characteristic pattern.

Location.—Often a sign standing alone on a factory roof and commanding an unobstructed view can be recognized at very great distances because of its location. This is limited by atmospheric transparency and by the total beam candlepower of that portion of the sign that is included in the base of a cone the apex of which is at the observer's eye and the angle of which is one minute. The reflected light from the letter face with good white surfaces may increase the total candlepower of the sign 50 per cent or more. At very great distances in ordinary signs the determining candlepower is the sign candlepower in that direction.

An interesting example came to the writer recently when driving at night with a friend about 9 miles (14.5 km.) from Cleveland, where an unusually large roof sign has been erected. On each side of this sign are 1,500 50-watt "Daylight Mazda" lamps. The sign extends from 250 ft. to 330 ft. (76 m. to 100.5 m.) above the street and appeared clear, sharp and white as though it protruded just above the horizon. My friend looked at it and then up at the zenith. "That's a queer place for the moon," he said. The atmospheric transparency was high. The maximum possible legibility distance in a strict sense was about 2 miles (3.2 km.) or less than one-fourth as far from the sign as we were. The sign, aided by its location, has high enough candlepower to catch the eye on clear nights at perhaps 20 miles (32 km.). ¶

Because the carrying power of a light source depends upon the square root of its candlepower, legibility in this sense is proportional to the square root of the candlepower of the sign, or perhaps five times as great for 75-watt lamps as it is for 10-watt lamps.

The effect of various factors influencing legibility is summarized below:

1. The theoretical maximum legibility distance is limited by the letter dimensions (and the particular letters employed) only.
2. This theoretical maximum is diminished, because to attract a sign must be bright and bright lines look wider than they really are. The amount (a) by which it is diminished depends upon the relative brightness of the sign and of the district.
3. The brightness of the sign may be compensated by a certain degree of atmospheric absorption. Even if this degree is just right, however, the theoretical maximum legibility distance cannot be attained. The amount (b) by which it will be less than the theoretical maximum depends upon the street and surrounding illumination.
4. When the atmospheric transparency becomes still lower the legibility distance is reduced. The amount of this reduction (c) depends upon the atmospheric absorption and the candlepower of the sign. Legibility distance is less for lower atmospheric transparencies and greater for higher candlepower signs.
5. When the atmospheric transparency is fairly high a sign may be seen further than it can be read. The amount (d) may be several hundred per cent. If the sign has a distinctive outside shape or is located in a distinctive place, it will be recognized at great distances. This is equivalent to being read by all those who are familiar with the publicity pattern or with the sign itself.

‡Many of these values are derived from tests of visual acuities conducted by a committee of the American Medical Association and which were incorporated in a paper by Charles Sheard, Ph. D., published in the *American Journal of Physiological Optics*, April, 1921, Vol. 2, No. 2, pages 168-184.

¶This particular sign has about 66,000 cp. and on clear nights would be visible 400 miles (640 km.) away except for the curvature of the earth. For clear atmosphere D (in miles) = 1.7 cp.

Same Wet and Dry Sparkover Obtained with Compensated Impulse Gap

Unaffected by Weather Conditions — Most Sensitive to Impulse Potentials—Characteristics from Test Data—Porous Porcelain Aids Metal Surfaces to Relieve Line Disturbances

By C. E. BENNETT
Chief Engineer Electro Service Company, Atlanta, Ga.

THE ideal lightning arrester would be one without an air gap which would sift out all transient potentials or superpotentials from the line and at the same time interrupt the dynamic current which follows a discharge. Impulses or oscillatory discharges superimposed upon the exposed transmission line naturally subject all of the line insulators, transformers and auxiliary equipment to this impulse or wave impact. The insulating materials have some appreciable power to withstand stresses without rupture for an interval of time until the superpotential is dissipated by grounding through the arrester.

However, all high-voltage alternating-current lightning arresters must necessarily have a spark gap between the line and the interrupting device and ground. If the spark gap can be set at slightly above line potential under all conditions of operation, it is apparent the device would have considerably greater protecting qualities since it would start earlier to drain the line of impulses.

The earlier installations of lightning arresters used horn gaps ahead of the arrester equipment. By some very exhaustive experimental research there was discovered the now well-known impulse ratio, which denotes the ratio of the impulse breakdown voltage of the gap to a continuously applied breakdown voltage. As a result of these data, the shape of the electrode best suited to all conditions was found to be a sphere.

Presence of Moisture Seriously Affects Ordinary Gaps

By referring to curves Fig. 3 it will be noted that the breakdown of a sphere gap is very much influenced by the presence of rain or other moisture. When, therefore, it is desired to use an unprotected sphere gap it can be readily seen that if it is set for dry-weather spacing, rain or moisture will cause the gap to spark over at considerably less applied potential. This precludes the use of a sphere gap for outside installations unless protected, as a wet spacing has to be given to it which requires nearly double line voltage to break down when dry. Referring to Fig. 1, we have the two settings, wet and dry, for horns, which show that the two curves more nearly coincide and the ratio of one to the other is approximately 65 per cent. The curves in both Fig. 1 and Fig. 3 show the breakdown or sparkover voltage at 60 cycles and impulse frequencies indicated in kilo-cycles.

In both Figs. 1 and 3 there is a wide difference between spark-over values at 60 cycles for wet and dry conditions, but the divergence is greatest for sphere gaps. Although this is the case, the sphere gap shows the least divergence between wet and dry conditions at impulse frequencies, the curves being almost identical with that for 60 cycles dry. On the other hand, the impulse characteristics of the horn gap differ not only between themselves but also as compared with the 60-cycle characteristics.

With the sphere or horn type of gap the curves definitely show that one setting for either wet or dry conditions, for 60 cycles, may be entirely wrong for impulse potentials, so that if the setting is spaced for 60 cycles, impulse voltages applied may be several times that of the 60-cycle value before the gap will break down. The insulation of the transformers, insulators, etc., may, therefore, be subjected to excessive stresses because the gap does not function properly or quickly.

New Type of Gap Unaffected by Moisture According to Tests

The ideal gap is one in which the range of voltage value of the settings under both wet and dry conditions and impulse voltages as against 60-cycle potentials will be nearly equal, and it should also be capable of easy calibration.

The new type of compensated impulse gap shown in the photograph has nearly the same arc-over voltage when wet as when dry, and it has a lower arc-over voltage for impulse potentials than for normal frequencies. These are the advantages that make it unusual and most valuable in service. It may receive a setting for dry conditions under normal voltage at 60 cycles without danger of discharging at lower potentials in wet weather. High-frequency disturbances will dissipate themselves through the gap and arrester even before reaching line-voltage value.

Each unit of the compensated impulse gap consists of a brass-pointed terminal about 1¼ in. (32 mm.) in diameter, mounted in the center of a convex disk of especially designed highly refractory porous porcelain which remains unaffected by the arc heat even if repeatedly applied. On the outer rim of this porcelain disk there is a metallic ring with a projection on the top to form an arcing horn. Back of the porous porcelain disk is an adjustable shield, which can be moved closer to the porcelain or away from it to increase the sensitiveness of the device to impulse potentials. The entire gap is supported from a ⅝ in. (17.4-mm.) shaft, and the arcing ring on the outside of the porcelain disk is supported by the spokes of the spider indicated in the drawing.

By use of the specially prepared and fired porous porcelain a non-metallic surface is presented to the raindrops or moisture, which are instantly spread or absorbed entirely, preventing the retention of drops

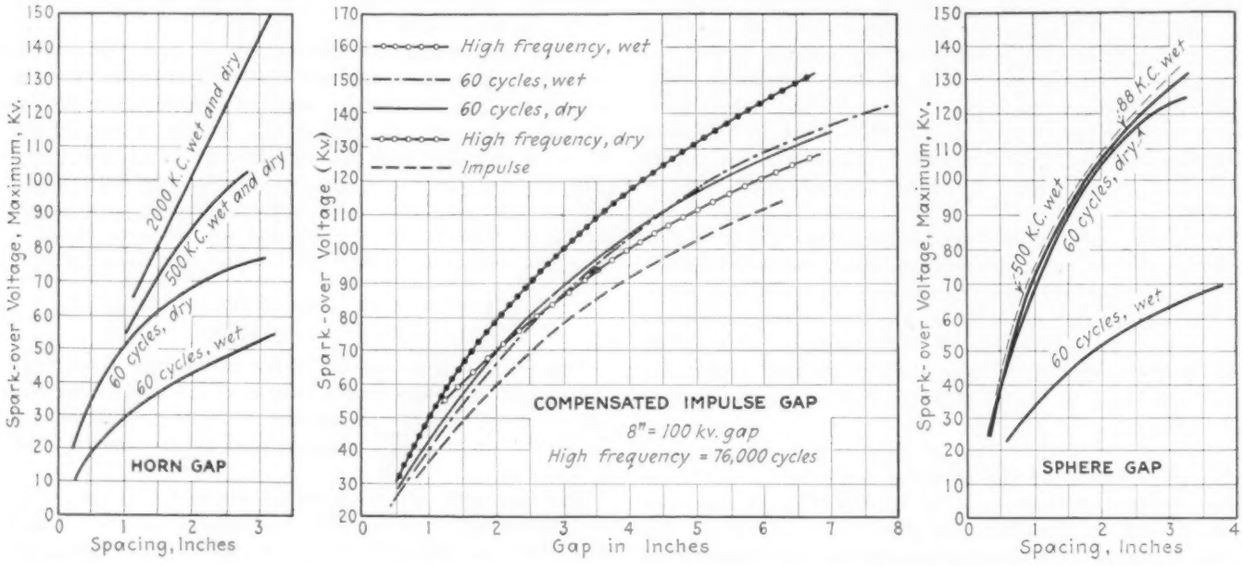
of water in the gap path. They then do not offer a point for flux concentration or shorten the gap distance, as is the case where all metallic terminals are used. The importance of this characteristic can be appreciated, especially with gaps of short spacing, where the presence of a drop of water may so decrease the gap spacing as to cause the gap to break down at a very much less potential than that for which it is set, with the consequent unnecessary disturbance of service supplied by the circuit. Collection of moisture in the form of drops, which are so often formed on metallic surfaces during foggy or damp weather, even when it is not raining, is impossible on porous porcelain, and the compensated impulse gap will, therefore, not operate at normal line potential due to this cause.

By the use of refractory porous porcelain that is not affected by the high temperature of the arc the pitting and roughening of the surface that is always found in operating when there is no necessity. The compensated impulse gap may be set so that it will break down at the required potential under all conditions and only discharge at the time when a discharge is necessary to protect the circuit from unusual conditions or disturbances.

DISCHARGE SURFACE INCREASES WHEN MOISTURE IS PRESENT

The functioning of this device under wet and dry conditions and impulse voltages is as follows:

It is well known that at ordinary commercial frequencies spheres of large diameter have a higher arc-over voltage for a given spacing than spheres with small diameter. In this new type of gap, when the porcelain is dry, the discharge area is equal to that of the brass point in the center, but when it is wet the porcelain acts more nearly as a conductor instead of an insulator



FIGS. 1, 2 AND 3—RELATIVE SPARK-OVER VALUES OF HORN, SPHERE AND COMPENSATED IMPULSE GAP UNDER WET AND DRY CONDITIONS WITH COMMERCIAL AND IMPULSE FREQUENCIES IMPRESSED

sphere or horn gaps after continued service is also avoided and the gap setting does not change its characteristics owing to any roughening effect. With metallic spheres it is not unusual, in short gaps, to find globules of melted metal that will represent 10 per cent of the gap setting and reduce the normal breakdown potential by that amount. In the case of large spheres with wide setting the whole nature of the gap is changed by this roughening or pitting, and instead of presenting a smooth polished surface to the charge, it soon becomes a series of points whose characteristic breakdown potential is entirely different from that of the original gap. This also has a tendency to fix the discharge at one point on the sphere, resulting eventually in actually burning holes through the metal or destroying it entirely. This does not occur in the compensated impulse gap, as is apparent on reference to the photograph of the gap. The fact that has the greatest bearing on the service performed by a line on which the compensated impulse gaps are installed, and which involves all the characteristics of the gap, is the ability to set the gap close to normal line voltage instead of being forced to give it a setting of double the normal voltage value in order to prevent it from and thus increases the available discharge area. In other words, this gap compensates for weather conditions by automatically replacing the small spheres or points with a large spherical terminal with no change in spacing due to the absorption of moisture by the porcelain disk, the porous porcelain, although a good insulator when dry, becoming a conductor when wet. These porcelain disks dry out almost immediately after a rain owing to the hysteresis effect caused by the electrostatic field always present at the gap when in service. Though the moisture in the air manifestly decreases the arc-over voltage value in the usual horn or sphere gap, it increases the arc-over value of these gaps somewhat as the larger disk of wet porcelain is equivalent to and takes on the characteristics of a large sphere. Thus gaps, as shown in the curves, have a higher breakdown value when wet than when dry, a most desirable function.

In the design of the compensated impulse gap it was desired to obtain a gap that would have an impulse breakdown voltage less than that of ordinary sphere gaps under dry-weather conditions. It is on the approach of a storm when the gaps are dry that the greatest stresses are often produced on equipment; the in-

sulators being dry, they do not absorb or tend to dissipate transient potentials as when all the insulators are wet. The potential gradient over insulators, bushings, etc., is considerably less when wet, and they can stand greater shock, as each unit is less likely to be subjected to overstressing. It is necessary, therefore, that a perfect gap should function upon the slightest voltage ripple due to switching surges, induced lightning potentials, static or impulses of any sort during dry-weather conditions.

As indicated in the curves, the dry-weather impulse potential curve of the compensated impulse gap is considerably lower than the 60-cycle continuously applied breakdown voltage, but can be adjusted in relative value. There are two adjustments on the gap which control the sensitiveness. One is accomplished by moving the adjustable metallic plates. When these plates are moved closer to the porcelain disk the sphere-gap characteristics under impulse potentials are obtained and the gap is less sensitive to impulse or high-frequency disturbances.

THEORY OF OPERATION OF COMPENSATED GAP

When the plates are close to the porcelain the total flux between the gap has been largely increased because of the greater capacity brought about by bringing the two comparatively large metallic plates closer toward the center of the gap, but the unit stress between the faces of the gap due to increased flux density has been decreased because of the approach to a sphere gap, and a greater impulse potential is required for spark-over. In other words, the dielectric between the electrodes, which includes the porcelain and air, is more uniformly stressed and therefore requires more potential to overstress or break down the gap.

By revolving the metallic plates away from the rear of the porcelain disks we obtain a highly sensitive setting to impulse potentials, since when the metallic shields are moved back from the porcelain disk the electrostatic capacity over the gap and the flux about the center points have been increased. Therefore the air around the points becomes more quickly overstressed, and as a result a more instantaneous breakdown occurs and at a lower potential than with the other setting, which is very similar to that of a sphere.

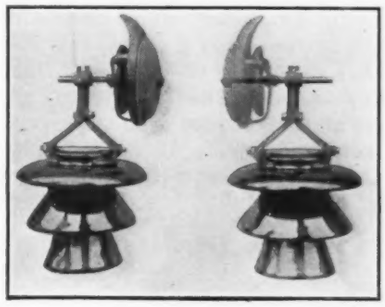
COMPARATIVE PERFORMANCE OF THREE TYPES OF GAPS

Voltage of System	Type of Gap	120 Per Cent Voltage or Setting for Wet Weather, 60-Cycles	Dry-Weather 60-Cycle Breakdown	Dry-Weather Impulse Breakdown	Wet-Weather Impulse Breakdown
33 Kv.	Sphere	40	81	89	89
	Horn	40	65	90	91
	Compensated	40	41	35	50
44 Kv.	Sphere	53	107	113	113
	Horn	53	76	148	148
	Compensated	53	55	48	66
66 Kv.	Sphere	73	141	153	153
	Horn	73	93	..	..
	Compensated	73	77	67	85
88 Kv.	Sphere	106	..	..	..
	Horn	106	118	..	..
	Compensated	106	106	93	120
110 Kv.	Sphere	132	..	..	..
	Horn	132	..	..	..
	Compensated	132	131	115	150

The moving of the adjusting plates forward and backward from the porous porcelain disk, when wet, does not influence the high-frequency or 60-cycle gap setting, the breakdown then following very nearly the characteristics of a large sphere.

The successful gap and lightning arrester must have very little time lag in order to protect apparatus from harm when subjected to impulse potentials.

An impulse voltage reflected upon electrical apparatus must involve the use of time and energy in order to rupture insulation. The destructive discharge through a dielectric requires not merely a sufficiently high voltage but a definite amount of energy. The destructive discharge does not occur instantly with its application, but a finite, though usually small, time elapses after the application of the voltage before the discharge occurs. During this time interval energy must be supplied to the dielectric. As a result, therefore, the perfect gap and arrester combination should function at the beginning of this period in order to absorb and dissipate disruptive energy and at the same time prevent its entering the apparatus which is to be protected.



Each unit of the gap consists of a brass-pointed terminal, mounted in the center of a convex disk of highly refractory porous porcelain. On the outer rim of this disk is a metallic ring. Back of the disk is an adjustable shield for regulating the sensitiveness to impulse potentials. When moisture is deposited on the porous porcelain it has the effect of increasing the discharge area of the gap and hence offsets the reduction in spark-over value ordinarily experienced with other types of gaps in wet weather. The porcelain dries out almost immediately after a rain.

FIGS. 4 AND 5—COMPENSATED IMPULSE GAP AND SURGE ARRESTER EQUIPPED WITH NEW GAP

If the arrester combination has a perceptible time lag, the impulse energy will be applied to the dielectric for a part of a time at a given rate and overstressing of the dielectric of the apparatus is sure to occur. Continual subjection to overstressing will cause injury and ultimate breakdown of such apparatus.

The compensated impulse gap fulfills all requirements of the ideal gap. It does not change its normal frequency breakdown value when wet or dry and can therefore have the close dry setting slightly above normal line potential with the assurance that it will not discharge at less than line potential when wet. It does not need protection by covering and is set up in free air with nothing to restrict its ventilation.

It will discharge impulse or high-frequency disturbances at their inception, giving them the least chance to rise to destructive values. Its impulse value and its normal frequency value are capable of calibration independently of each other. It presents a fixed breakdown value to all discharges even under the heaviest rainfall and needs no weather protection for this function.

The Story of the Cincinnati House-Wiring Campaign

How the Central-Station Company, Through Intensive Sales Effort, Is Wiring Old Houses at the Rate of 1,364 a Month

BY S. D. HEED
General Manager Union Gas & Electric Company, Cincinnati, Ohio

IF A MAN can take cucumbers and cabbages and turn them into a million dollars, his methods merit attention; and though some people may think an ocean pier at Atlantic City has nothing to do with selling pickles, if you doubt it, you have but to ask the H. J. Heinz Company. As any succcessful department store will testify, there are benefits to be derived from a special sale even if the only thing special about it is the publicity. Such slogans as "His master's voice," "The 57 varieties" and "The flavor lasts" were all designed for definite purposes and it all spells "merchandising." It matters little whether you handle talking machines, pickles, chewing gum or house wiring.

HOUSE WIRING MUST BE MERCHANDISED

Selling house wiring is fundamentally the same as selling any other commodity on the open market. To produce results it must be merchandised. There must be a plan of campaign, supported by publicity and, most important of all, followed up with real salesmanship. It is fatal to make the mistake of employing "order takers." Any one can take an order after the prospective customer is "sold." But to our way of thinking salesmanship does not begin until after the "prospect" has first said "no." And selling wiring is a salesman's job. He will need all the help that can be given.

In the city of Cincinnati 15,000 homes were wired and connected to the lines of the Union Gas & Electric Company during the year 1921. The first four months of 1922 show an average of 1,364 new contracts each month, while in the month of April 1,651 homes were "sold" in Cincinnati, breaking all previous records. If Cincinnati has accomplished anything unusual by wiring about 25,000 homes during the last two years, this has resulted from hard work and not from a lucky turn of the wheel of fortune. Methods have been adapted to conditions, but behind all has been the driving force of persistent salesmanship. That intangible something has been provided which gets the name on the dotted line.

It must be understood that Cincinnati is an old and very conservative city. An overwhelming proportion of its residences were originally built without electric wiring. Since 1908 the people have been using cheap natural gas with exceptionally good service. These factors have greatly retarded electrical progress, so that in promoting electrical development the central-station company felt obliged to do the pioneering work of getting these old houses wired. All supplementary development has been left to the independent contractors and dealers. This activity on the part of the lighting company has so stimulated the electrical business generally that all branches of the industry have profited. Independent wiring contractors are actually doing more work because of it.

In general, this is the sales plan: Cincinnati has been divided into definite territories sufficiently small to intensify sales activity, for too much territory for the individual salesman is worse than too little. A salesman has been placed in each territory with every unwired house as a "prospect." After careful analysis, territories were reduced in size to increase sales activity, and in most instances salesmen have been changed about to overcome staleness. We have worked on the salesmen as well as on the prospective customers. Departmental meetings have been held featuring applied psychology, scientific salesmanship and inspirational talks. Competitive prizes have been given to stimulate individual effort, and letters of encouragement addressed to the salesmen at their homes.

At the beginning of the 1921 campaign we naturally desired first of all to sell to those residences along existing lines and requiring no extensions. An attempt was made to classify from existing data all unwired homes to that end, but this could not be done accurately without a field survey, which we did not have time to make. Moreover, in order to keep our salesmen at maximum production, we realized that they should be kept busy on live "prospects," but we could not take the time necessary to compile preferred lists. To overcome these difficulties we started with newspaper advertising carrying a corner coupon which, if returned, almost invariably produced a contract. As soon as possible we put out a second man in the weaker territories. It is his duty to call at every unwired house and, if possible, make an appointment for the regular salesman to follow him with an estimate, this system gradually being extended to all territories.

VALUE OF HOUSE-TO-HOUSE SELLING

This work was conducted very aggressively from house to house, and these men worked each territory systematically block by block. Records of all unwired houses were classified as reached as to prospective business and are followed up until the sale is made. It is recognized as fundamental and irrefutable that persistent, courteous, personal solicitation will eventually break down sales resistance. Salesmen and canvassers are both paid on a commission basis, this being determined not alone by the number of contracts taken but also by the number of outlets sold.

With this organization in the field, it, of course, became necessary to help "open the door" to these men. Advertising has been used as an economical means of doing part of the work which would otherwise have to be done at much greater expense by the individual salesman. Newspapers are the backbone of this effort. Direct-by-mail letters and booklets, screen announcements in the motion-picture theaters and attractive stuffers for monthly gas bills are also used. All advertising carries the atmosphere of better lighting, more desirable living conditions and less labor in the home, and is designed to sell the idea of reliable service. The appeal is maintained by stressing seasonal features and by repeating the following offer, which gave the original impetus to home wiring in Cincinnati:

"We will wire your home, install fixtures complete, run service lines, set meter and turn on the electric light. After using this service for thirty days, if you are not satisfied, we will remove the electric installation, replace your gas fixtures, leave your house in first-class condition, and you will not owe us one cent—not even for the current used.

"If you are satisfied, you may pay us for the wiring and fixtures in eighteen easy monthly installments—the

bills conveniently attached to your monthly electric light statements."

About 25,000 homes have been wired under these terms, and not one installation has yet been removed. The deferred accounts thus created have totaled nearly $2,250,000, and they have been collected regularly with very rare and entirely negligible losses. The success of the present campaign is not due to any change in merit of the thing we have to sell or to any change in wording of our proposition to the public. Our results have been obtained absolutely through organized salesmanship. We simply provided that which is necessary to get the name on the dotted line, and this is not hazardous when the customer has thirty days' free trial.

Also, in addition to the wiring possibilities, we believe there are wonderful opportunities for appliance merchandising. Right here in Cincinnati we find that if we were to consider all the possible appliances and then discount the total possibilities to a practical basis of, say, four items, such as a fan, a flatiron, a vacuum cleaner and a washing machine, this would give us at least $200 in retail sales which could be made immediately to the residences which we are electrifying. When these figures are applied to our totals they run into a stupendous total.

On a basis of new customers added during last year this would amount to $3,000,000; on our estimate of the customers to be added this year it would amount to $4,000,000, and on a basis of the consumers on our lines previous to this recent campaign who are not yet well supplied with appliances, we believe there is an additional $6,000,000. These possibilities total some $13,000,000 in appliance sales figured on a very conservative basis. All of this work is staring our dealers squarely in the face and it offers almost unbelievable opportunities to the electrical industry.

Temperature Rise of Electric Machines on Intermittent Duty

In This Article an Approximate Method of Calculation Is Illustrated Which Is Applicable to Entire Machine or to Any Part Thereof—Based on Uniform Distribution of Losses

By G. E. LUKE
Motor Engineering Department, Westinghouse Electric & Manufacturing Company

MANY electrical machines are required to operate under a variable-duty cycle. This is especially true of industrial motors. In such applications the first step is to ascertain whether the machine is strong enough mechanically and whether the electrical performance, such as commutation, is satisfactory on the maximum peak loads. Should the application be safe mechanically and electrically, then the only remaining requirement is to know what the temperature rise will be.

In many industrial-motor applications the intermittent load varies with such regularity that the motor is usually applied on the basis of the root-mean-square current taken over the average cycle. This method is satisfactory where the peak loads are of short time duration because the heat loss in the machine can be stored in the iron and copper without an excessive rise. This heat is liberated when the machine is running under light loads.

When a duty cycle exists containing heavy peak loads, for comparatively long periods, the safest method, of course, is to use a machine with a continuous rating equal to the maximum load. If this is not done, then it will be necessary to check the temperature rise on the maximum peak.

The temperature rise of a machine on any given short-time load involves many factors which make a rigid mathematical solution of the problem virtually impossible. However, a comparatively simple approximation can be made by assuming that the heat losses in the machine or any part thereof are uniformly distributed. This is not strictly correct, but is permissible, since the heat losses will distribute themselves to a certain degree by conduction through the iron and copper.

The solution involves the following factors:

W = watts loss in machine or part considered,
T_c = temperature rise in deg. C. on continuous duty,*
T_t = temperature rise in deg. C. at end of time (t),
T_s = temperature rise in deg. C. at start of cycle,
t = time in hours the load is applied,
$W/T_c = K_v$, or the ventilation constant,
P = weight in pounds of machine or part considered
$t_1 = 0.06\,PT_c/W = 0.06\,P/\,K_v$.

This constant (t_1) is the thermal time constant of the machine and is equal to the time in hours necessary to raise the temperature of the machine to a rise of (T_c) deg. C. with the loss (W) and no ventilation. That is all of the heat loss to be stored up in the machine.

Assuming that a given load is applied for time (t), the following statement is true:

Total heat energy loss = stored energy + energy dissipated by ventilation (1)

The foregoing statement may be put in the following form:

$$t = 2.3t_1\log_{10}(T_c - T_s)/(T_c - T_t) \qquad (2)$$

This equation can be solved with the aid of logarithm tables or the ordinary slide rule. The solution can also be expressed as follows:

$$T_t = T_c - (T_c - T_s)e^{-t/t_1} \qquad (3)$$

The values of the factor ($e^{-t/t}$) are given in Fig. 1 for various values of t/t_1.

*This temperature rise is above room air for self-ventilated machines and for forced ventilated machines is the rise above intake air.

When the motor starts cold—that is, with no initial rise—$T_s = 0$—equation (3) becomes:

$$T_t = T_c(1 - e^{-t/t_1}) \quad (4)$$

When the machine is cooling with no loss, equation (3) becomes:

$$T_t = T_s e^{-t/t_1} \quad (5)$$

The above solutions are general and can be applied to a machine as a unit or any part thereof. However, it is more correct to use the above solution with reference to the armature alone, when considering direct-current motors, because the armature is generally the weakest part of the motor under overloads and failures usually occur there first. This is due to the fact that the heat-storage capacity of the armature is relatively less than the motor as a whole, the watts loss per pound being usually much larger for the armature than for the motor.

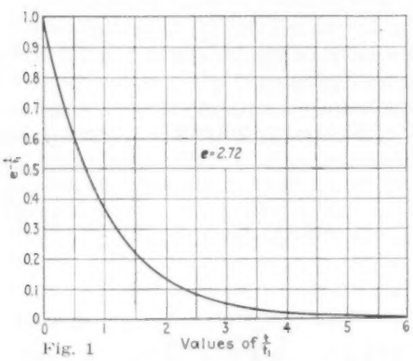


Fig. 1

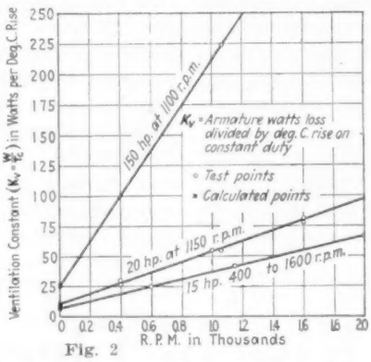

Ventilation Constant ($K_v = \frac{W}{T_c}$) in Watts per Deg. C. Rise
150 hp. at 1100 r.p.m.
K_v = Armature watts loss divided by deg. C. rise on constant duty
Test points
Calculated points
20 hp. at 1150 r.p.m.
15 hp. 400 to 1600 r.p.m.
R.P.M. in Thousands

Fig. 2

FIG. 1—VALUES OF e^{-t/t_1} FOR USE IN TEMPERATURE RISE CALCULATIONS
FIG. 2—VENTILATION CONSTANTS FOR THREE DIRECT-CURRENT MOTORS AT VARIOUS SPEEDS

DETERMINATION OF CONSTANTS

As previously indicated, W is the watts loss in the machine or part considered. If the armature alone is involved, W can be found by adding the separate losses or else determined from the efficiency of the motor. Thus the losses in the armature can be considered as the total losses minus the field losses. T_c, which is the temperature rise on continuous duty of the machine or part considered with its loss W, is a function of the ventilation for a given machine and is generally known at the machine's rating. The ventilation constant K_v of which T_c is a function ($T_c = W/K_v$), is given in Fig. 2 as a function of speed for three particular motors. Practically it is represented by a straight line, hence with two points known the line is determined. As previously mentioned the temperature rise is known at the continuous rating, and this locates one point. The second point on the line can be approximated at zero speed; this value of $K_v = 0.01$ armature surface when the r.p.m. = 0. The armature surface is to be taken as the total surface of a cylinder with a diameter equal to the armature diameter and a length equal to that of the armature including the commutator and end windings.

In applying this method equation No. 3 is employed. Any one factor can be determined when the others are known. This method of calculation has been checked by many tests one of which is shown in Fig. 3, which applies to a variable-speed direct-current motor rated at 15 hp., 230 volts, 400-1,600 r.p.m. Thermocouples were placed in the armature so that the temperature rise could be read while running. The ventilation constant (K_v) is given on Fig. 2 for various speeds.

The following cycle run was made:

Conditions during first hour: 230 volts, 53 amp., 1,065 r.p.m.

In this case $K_v = 57$ (see Fig. 1). P (weight of armature) = 279 lb., hence $t_1 = (0.06 \times 279)/57 = 0.294$. The armature loss $W = 1{,}880$ watts, so that $T_c = 1{,}880/57 = 33$ deg. C.

With these constants known, the rise T_t for any time (t) can be found. For instance, when $t = \frac{1}{2}$ hour, substitution in equation No. 3 gives:

$$T_t = T_c - (T_c - T_s)e^{-t/t_1}$$
$$= 33 - (33 - 0)e^{-0.5/0.294}$$
$$= 33(1 - e^{-1.7})$$

Value of $e^{-1.7}$ is 0.183; hence $T_t = 33 \times 0.817 = 27$ deg. C. (see Fig. 3). The other points are found in the same manner.

Condition during next twenty minutes: 230 volts, speed zero, current zero.

In this case the ventilation is reduced, which will change the value of t_1. From Fig. 2 $K_v = 10.5$; hence: $t_1 = (0.06 \times 279)/10.5 = 1.59$; $T_c = 0$; $T_s = 31.9$ deg. C.

when $t = \frac{1}{3}$ hour. Substitution in equation No. 3 gives:

$$T_t = T_c - (T_c - T_s)e^{-t/t_1}$$
$$= 0 - (0 - 31.9)e^{-0.333/1.59} = 31.9\ e^{-.209}$$

Value of $e^{-.209}$ (see Fig. 1) = 0.82; hence $T_t = 0.82 \times 31.9 = 26.1$ deg. C. Other points on the curve may be found in the same way. (See Fig. 3.)

Condition during next half hour: 230 volts, 1,065 r.p.m., 69 amp.

In this case the ventilation (r.p.m.) is the same as in (1), hence K_v and t_1 will be the same. The loss $W = 2{,}750$ watts; hence $T_c = 2{,}750/K_v = 2{,}750/57 = 48.2$ deg. C.; $T_s = 26.1$ deg. C.

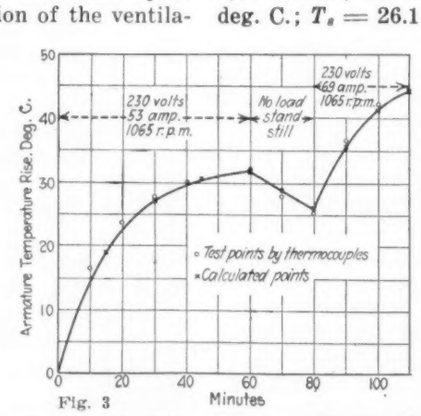

Armature Temperature Rise, Deg. C.
230 volts 53 amp. 1065 r.p.m.
No load stand still
230 volts 69 amp. 1065 r.p.m.
Test points by thermocouples
Calculated points
Minutes

Fig. 3

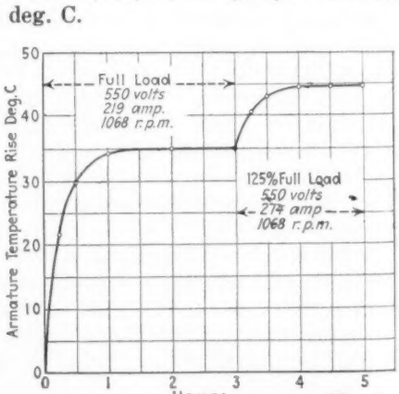


Fig. 4

FIG. 3—HEATING CURVE OF A 15-HP., 230-VOLT, 400-1,600-R.P.M. DIRECT-CURRENT MOTOR. FIG. 4—HEATING CURVE OF A 150-HP., 1,100-R.P.M. DIRECT-CURRENT ARMATURE

When $t = \frac{1}{2}$ hour (30 minutes) substitution in equation No. 3 gives:

$$t_t = T_c - (T_c - T_s)e^{-t/t}$$
$$= 48.2 - (48.2 - 26.1)e^{-0.5/0.294}$$
$$= 48.2 - 22.1e^{-1.7}$$

(see Fig. 1). Value of $e^{-1.1}$ is 0.18; hence $T_t = 48.2 - (22.1 \times 0.18) = 44.2$ deg. C.

Another example will probably clarify this problem. For instance, an induction motor has a rating of 75 hp., 550 volts, 72 amp., with a 40 deg. C. rise on continuous duty. What horsepower will it carry for one hour starting cold with a rise of 40 deg. C. at the end of the hour?

CALCULATIONS EQUALLY APPLICABLE TO OTHER TYPES OF MOTORS

At the rating the efficiency is found to be 90.5 per cent from the motor performance curve; hence the kilowatt input $= (75 \times 0.746)/0.905 = 61.8$. So that the loss $W = 61.8 - (75 \times 0.746) = 5.8$ kw. Therefore $K_v = 5{,}800/40 = 145$.

The weight of the motor (less the weight of cast-iron frame) is about 1,000 lb.; so that

$$t_1 = (0.06 \times 1{,}000)/145 = 0.413.$$

Hence, from equation (3),

$$T_t = T_c - (T_c - T_s)e^{-t/t_1}$$

when $t = 1$, $T_t = 40$ deg. C. and $T_s = 0$.

Therefore $40 = T_c(1 - e^{-1/0.413})$. The value of $e^{-1/0.413}$ is 0.088 from Fig. 1. Hence $T_c = 40/0.912 = 43.8$ deg. C.

With this continuous rise the loss $W = 43.8\,K_v = 43.8 \times 145 = 6{,}360$ watts. From the performance curve the motor will deliver 82 hp. at 550 volts, 77 amp., and its efficiency will be 90.5 per cent, which will give a loss of 6,360 watts. Therefore the above motor will carry 82 hp. load for one hour starting cold with a rise of 40 deg. C. at the end of the one-hour run.

On direct-current motors with highly ventilated armatures the value of the thermal time constant t_1 of the armature is small. In other words, many of these machines when run for a period of one hour will be very near to their final temperature rise. Hence when such a motor has a 125 per cent rating for two hours with a 55 deg. C. rise its final rise on this load continuously will not materially differ from 55 deg. C. This condition is shown on the heating of a 150-hp. direct-current motor armature on Fig. 4. It shows that on such duty cycles the thermal capacity of the motor has practically no effect upon the final temperature rise. In other words, the final rise is approximately the same as that which would be obtained on continuous operation at the overload.

THERMAL CAPACITY MUST BE CONSIDERED CAREFULLY

There are many motors such as inclosed-motors, crane and mill motors which have large copper and iron masses in proportion to the losses, and in these the thermal capacity of the machine is a greater factor. In such motors it is possible to find their one-hour rating two or three times the continuous rating. The method of calculation given above is equally applicable for these motors.

The application of open ventilated and continuous rated motors to short-time loads of 150 per cent or more of the continuous should be done with caution because of the fact that the difference between the internal "hot-spot" temperature and that observed by thermometers increases with the load, so that on overloads it is possible to obtain an abnormal internal temperature without exceeding the safe temperature as found by thermometers.

Squier on "Wired Wireless" for Creating Good Will

Broadcasting Through Lamp Socket as a Means of Promoting Public Friendship—Central Stations Logical Medium for Such Entertainment

WITH their electric service lines extending over the entire country and reaching even the isolated farmer, central-station companies are the logical medium for broadcasting entertainment and news over their circuits and through the lamp sockets, declared Gen. George O. Squier in addressing the electrical apparatus committee at the Atlantic City N. E. L. A. convention last week. Judging from the demand for this wireless service, he expressed the belief that broadcasting through the lamp socket by means of "wired wireless" or carrier current would meet with universal public favor. Hence it should be one of the best opportunities open to public utilities for creating good will. The public has become accustomed to look to the electric socket for every domestic convenience, and it should have the opportunity to look there for entertainment as well.

That the service can be rendered has already been demonstrated in a small way. Just recently, the General announced, broadcasting over 10 miles of cables and through the intervening transformers was successfully accomplished in Chicago with a 50-watt sending set. How the technical problems of extending the service over large networks shall be solved is a detail for engineering talent. That the idea is new and theoretical obstacles exist constitutes no reason for hesitation in rendering this service. The best way to achieve results, said General Squier, is to experiment.

LOOKS TO LAMP SOCKET TO REPLACE ANTENNA AND BATTERY

At present reception of space broadcasting has the objection that antennas in some form are required. Difficulties in erecting aërials have already been experienced in some localities, and they may be expected to increase as outfits are installed promiscuously. With carrier-current broadcasting through the lamp socket the need for the aërial is eliminated. Only a small condenser has to be inserted between the socket and an ordinary receiving set. General Squier looks to the day when the lamp socket will also furnish the power for operating the radio tubes so that the inconvenience of charging storage batteries will be eliminated.

Another possibility presents itself to the central-station company, said General Squier—namely, the broadcasting of entertainment or news originating in its own headquarters and the transmission of entertainment received from space-broadcasting stations as well. With the facilities that engineering talent can provide the customer can select the entertainment desired.

Another very important advantage of carrier-current broadcasting is that it will not interfere with reception of other broadcasting. It can be virtually confined to the wired system or its immediate locality, thus leaving the ether free for such broadcasting as must be carried on by space radio.

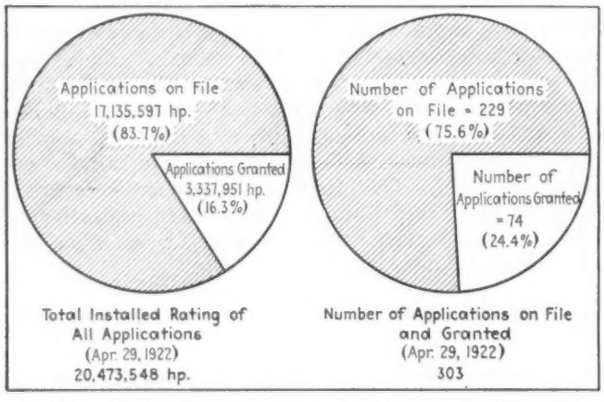
The General recognized that certain engineering problems still have to be solved in carrier-current broadcasting over electric service lines, but he expressed the belief that it has come to stay.

Water-Power Applications Total 20,473,548 Hp.

Federal Power Commission Has Received 303 Applications for Preliminary Permits and Licenses and of These Had Granted Seventy-four Up to and Including April 17, 1922

DURING the last eight months applications for preliminary permits and licenses have been filed with the Federal Power Commission at the average rate of about eight a month. The commission on April 29 reported that 303 applications had been filed since the organization of the commission, an increase during the previous eight months of fifty-nine. The installed rating of projects on file on April 29 and granted previous to that date totaled 20,473,548 hp., which is about double the present hydro-electric development of the country.

The projects included in filings made during the



ALMOST ONE-QUARTER OF THE APPLICATIONS ON FILE HAVE BEEN GRANTED PRELIMINARY PERMITS OR LICENSES

period from Aug. 31, 1921, to April 29, 1922, involve an average of 100,499 hp. Almost every section of the country is represented in the applications filed during the eight months. California leads the country with eighteen applications filed during this period, and Washington and Oregon follow with six and four respectively. The Pacific Coast States, therefore, lead the country in the number of applications filed during this period with 51 per cent, and they have 64.5 per cent of the total horsepower involved.

The largest project recorded during these eight months was that of the Southern California Edison Company involving a dam and power house at Boulder Canyon, on the Colorado River, and a second dam and power house in Pyramid Canyon, on the same river. This project involves a total development of 1,200,000 hp., but is in conflict with previous filings. The Utah Power & Light Company and Hugh L. Cooper of New York City both filed for projects involving 800,000 hp. each.

The project of the Utah Power & Light Company involves a development on Green River between Flaming Gorge and Rattlesnake Canyon and also one on the Yampa River. The Green River portion of this project involves a series of dams and pools, six in all, with power houses at each, and the development on the Yampa River consists of a series of four dams and power houses. The project filed by Hugh L. Cooper involves a dam and power house on the Columbia River at the Grand Coulee site in the State of Washington.

Table II gives the location and size of the water-power projects for which applications for preliminary permits and licenses were filed with the Federal Power Commission from Aug. 31, 1921, to April 29, 1922. The list of applications filed prior to Aug. 31 appeared in the issues of the ELECTRICAL WORLD for Jan. 1, Jan. 15, Feb. 12, March 12, April 9, June 18 and Sept. 24, 1921.

A total of seventy-four licenses and permits had been granted by the commission on April 17, 1922, of which thirty-eight were preliminary permits and thirty-six were licenses. The developments represented in these projects involve a total of 3,337,951 hp. and are scat-

TABLE I—PERMITS AND LICENSES AUTHORIZED BETWEEN AUG. 24, 1921, AND APRIL 17, 1922, INCLUSIVE.

Project No.	Permit or License	Name of Company	Location of Project	Installed Capacity, Hp.
185	L	Southern Sierras Pwr. Co.	High Creek, et. al., Cal.	4,000
138	P	George C. Hazelet	Silver Lake, Alaska	1,500
190	P	Unitah Power and Light Co.	Pole Creek & Unitah River, Utah	2,400
173	P	Connecticut River Co.	Connecticut River, Conn.	32,000
255	L	Southern Sierras Power Co.	Transmission line, Cal.	.....
201	P	City of Petersburg	Crystal Lake, Alaska	1,000
223	P	C. B. Hawley	New River, West Va.	20,000
253	L	Henry Weber	Denny Creek, Col.	100
154	P	Elmore Copper Co.	So. Fork Boise River, Idaho	6,000
172	P	Louisiana Gravity Canal Co.	Calcasien River & Bayou, Cocodrie, La.	55,000
177	P	Ocklawaha Reclamation Farms	Ocklawaha River, Fla.	1,000
206	L	George Inlet Packing Co.	Beaver Falls Creek, Alaska	90
157	P	Alaska Development & Mineral Co.	Tyee & Anan Creeks, Alaska	18,000
212	P	Hirst-Chichagof Mining Co.	Head of Didrickson Bay, Alaska	400
213	L	J. H. Cann	Cann Creek, Alaska	75
241	L	Freshwater Bay Lumber Co.	Creek not named, Alaska	100
63	L	Alaska-Endicott Mining & Milling Co.	Beardslee River, Alaska	1,000
245	L	The Darwin Silver Co.	Transmission line, Calif.	.....
236	L	Blue Mt. Irrigation Co.	Pole Canyon Spring, Utah	40
21	P	W. R. Banks	Osage River, Mo.	4,000
163	P	Myser, J. F., & Drach, E. E.	Frying Pan River, Col.	100,000
159	P	City of Boise	Payette River, Idaho	30,000
184	L	Eldorado Power Co.	So. Fork, Amer. River, Cal.	100,000
96	L	San Joaquin Lt. & Pwr. Corp.	San Joaquin River, Cal.	45,000
160	P	Alaska Public Utilities	Power Creek, Alaska	1,500
268	P	City of Oskaloosa	Des Moines River, Iowa	2,700
214	P	Dixie Power Co.	No. Fork White River, Ark.	36,000
262	P	Hardaway, Benj. H.	Choctawhatchee River, Ala.	5,000
266	P	Hardaway, Benj. H.	Pea River, Ala.	3,000
175	L	San Joaquin Lt. & Pwr. Corp.	Kings River, Cal.	266,000
271	P	Caddo River Pwr. & Irr. Co.	Ouachita River, Ark.	50,000
261	P	Hughes, John H.	French Creek, Cal.	4,000
120	L	Southern Cal. Edison Co.	San Joaquin River, Cal.	195,000
135	L	Portland Ry., Lt. & Pwr. Co.	Clackamas River, Ore.	30,000
234	P	Portland Ry., Lt. & Pwr. Co.	Clackamas River, Ore.	*34,000
155	L	Southern Sierras Power Co.	Snow Creek, Cal.	3,750
292	L	California-Oregon Pwr. Co.	Transmission line, Cal.	.....
298	L	So. California Edison Co.	Kaweah River, Cal.	9,500
90	P	Baum, F. G.	Little Colorado River, Ariz.	15,000
143	P	Mushen & Cronemiller	Deep & Camas Creeks, Ore.	800
61	P	Wrangell Pulp & Paper Co.	Harding Creek, Alaska	3,000
149	L	Wyoming Power Co.	Big Horn River, Wyo.	1,300
150	L	Central Ariz. Lt. & Pwr. Co.	Transmission line, Ariz.	.....
		Total horsepower		1,082,255

* Primary.

TABLE II—PERMITS AND LICENSES RECEIVED BETWEEN AUG. 31, 1921, AND APRIL 29, 1922

Project No.	Permit or License	Name of Company	Location of Project	Installed Capacity, Hp.
ALABAMA:				
262	P	Benjamin H. Hardaway	Choctawhatchee River	5,000
267	P	A. E. Killebrew	Choctawhatchee River	5,000
276	P	Houston Power Co.	Choctawhatchee River	2,000
ALASKA:				
246	P	Frank C. Dougherty	Crater, Long and Tease Lakes	80,000
269	P	City of Wrangell	Mill Creek	2,700
ARKANSAS:				
271	P	Caddo River Pwr. & Irr. Co.	Ouachita River	50,000
286	P	Maxfield, Earnheart	White River	1,200
CALIFORNIA:				
245	L	Darwin Silver Co.	Transmission line	
255	L	Southern Sierras Pwr. Co.	Transmission line	
247	P	W. H. Samson	Stuart's Fork, Trinity River	25,000
256	L	Mitchell Tersich	Eagle Creek	
248	P	Southern Sierras Pwr. Co.	Bear Creek and Santa Ana River	25,000
258	P	Southern California Co.	Boulder Canyon, Colorado River	1,200,000
249	P	Lars Jorgensen	Feather River	350,000
260	P	San Joaquin Lt. & Pwr. Co.	South Fork, Merced River	110,000
251	P	R. T. Harding	Bucks and Grizzly Creeks	10,000
275	P	Hutton, McNear & Dougherty	Cascade Creek	15,000
252	P	Ed Fletcher	Santa Isabel Creek	1,800
284	P	Mokelumne River Pwr. & Lt. Co.	Mokelumne River	
261	P	J. H. Hughes	French Creek	4,000
291	P	Great Western Pwr. Co.	Bucks, Pine Rock Creeks	30,000
270	P	Mendota Irrigation District	Kings River	
292	L	California-Oregon Pwr. Co.	Transmission line	
280	L	Frank M. Wilson	Willer & Camp Creeks	70
298	L	Southern Calif. Edison Co.	Kaweah River	9,500
COLORADO:				
300	P	Thebo, Starr & Anderton	McCloud and Pitt Rivers	160,000
253	L	Henry Weber	Denny Creek	100
301	P	Clare N. Stannard	Grand River	65,000
FLORIDA:				
263	P	William J. Barker	Grand River	65,000
GEORGIA:				
266	P	Benjamin H. Hardaway	Pea River	3,000
303	P	Benjamin H. Hardaway	Chipola River	7,500
IDAHO:				
282	L	Idaho Power Co.	Transmission line	
ILLINOIS:				
287	P	State of Illinois	Fox River	2,000
IOWA:				
268	P	City of Oskaloosa	Des Moines River	2,700
KENTUCKY:				
289	P	Louisville Gas & Elec. Co.	Ohio River	90,000
MINNESOTA:				
285	P	St. Cloud Public Service Co.	Rigby site	15,000
250	P	Northern States Pwr. Co.	Mississippi River	60,000
MONTANA:				
273	P	Peter F. Karst	Moose Creek	20
277	P	Eureka Hydro-Electric Co.	Graves Creek	2,500
NEVADA:				
296	L	Mineral County Lt. & Pwr. lines	Transmission line	
265	P	Guy P. Mohler	Colorado River	400,000
NEW MEXICO:				
254	L	Rio Grande Lt. & Pwr. Co.	Rio Grande River	25,000
NORTH CAROLINA:				
295	L	Black Mountain Tel. Corp.	Transmission line	
OREGON:				
281	L	California-Oregon Co.	Transmission line	
259	P	Fort Klamath Meadows Co.	Fort Klamath Meadows	1,000
288	L	Grant's Pass. Irr. Dist.	Dam in Rogue River	2,000
293	P	Pacific Pwr. & Lt. Co.	Snake River	650,000
TENNESSEE:				
299	P	Smith-Sanders Power Co.	Holston River	25,000
UTAH:				
279	P	Utah Pwr. & Lt. Co.	Green River	800,000
290	P	James H. Mays	Huntington Creek	1,200
VIRGINIA:				
283	P	Edward T. Brown	Pitt Spring Run	1,000
WASHINGTON:				
264	P	Northwestern Elec. Co.	Lewis River	125,000
278	P	Spirit Lake Ry. & Pwr. Co.	Toutle River	50,000
257	P	J. G. Galvin	Aarons Creek	12,500
272	P	Hugh L. Cooper	Columbia River	800,000
274	P	Pacific Pwr. & Lt. Co.	Deschutes River	50,000
297	P	Willow Creek Mines	Craigie Creek	650
WISCONSIN:				
302	P	White Rapids Paper Co.	Menominee River	10,000
Total horsepower				5,380,462

tered throughout the country. The largest project for which a license has been granted by the commission is that of the Southern California Edison Company on Big Creek and the South Fork of the San Joaquin River, California, involving a total development of 545,000 hp.

Table I gives the location and size of the projects for preliminary permits and licenses granted from Aug. 24, 1921, to April 17, 1922. A list of preliminary licenses and permits granted prior to Aug. 24, 1921, was published in the Sept. 24, 1921, issue of the ELECTRICAL WORLD.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Powdered Fuel in Power Plants

To the Editors of the ELECTRICAL WORLD:

The editorial on page 168 of the Jan. 28 issue of the ELECTRICAL WORLD, entitled "Future of Powdered Fuel in Power Plants," does not by any means describe the wonderful progress which has been made in the last four years in firing boilers with powdered fuel. The statements you make are misleading. Under date of Feb. 11 you printed a very comprehensive article by a consulting engineer whom we all know and respect very highly, E. B. Powell, of Stone & Webster. This article is a very good answer to quite a number of the points brought up in your editorial of Jan. 28.

Your editorial would have been very appropriate if it had been printed in the early part of 1916, as at that time there was only about 2,000 rated horsepower fired with pulverized fuel in operation, while for some thirty years previous nobody had been able to operate a boiler of more than 100 hp. to 300 hp. or 400 hp. for more than three or four months at a time, owing to the fact that the relation between the amount of coal burned and the size of the furnace was not fully understood and the coal was not pulverized finely enough. H. G. Barnhurst discovered this relation between furnace volume and fuel. Today 140,000 boiler hp. to 150,000 boiler hp. is developed with powdered fuel, compared with about 2,000 in 1916. In regard to the low-grade fuels which you say are hardly touched and heretofore considered unusable one of the first plants installed has been running successfully for at least three years, burning coal containing approximately 30 per cent moisture which has been lying exposed to the weather for fifteen years or more. The fuel was used under ten 500-hp. boilers operated at 150 to 200 per cent continuously.

In another plant, a sugar refinery, where the service has been continuous day and night for three years, they have been using coal containing only 9,300 B.t.u. per pound and 28 per cent of ash under thirteen boilers previously fired with fuel oil. The furnaces were redesigned to suit pulverized-coal conditions and the boilers are operated at 150 per cent of rating.

In the anthracite-coal regions there is a 10,000-kw. plant which has been operating for nearly a year, using refuse from the mines which is usable, and the results are so satisfactory that the owners contemplate building another plant similar to the present one, if not larger, to be operated in the same way. In another plant this same company uses pulverized culm or waste, operating its boilers at 300 per cent of rating continuously and sometimes as high as 400 per cent. Capacity equal to stoker firing can be maintained with even better results when the furnace and equipment are designed to suit known operating conditions.

Regarding the cost of pulverizing, we are supplied

with sufficient reliable data and information to say that this expense will run from 30 cents to 70 cents per net ton, depending on the cost of energy per kilowatt-hour and the amount of fuel pulverized per day of twenty-four hours. These figures include all repairs, power, labor and cost of drying the fuel, based on coal at various prices, and do not include the fixed charges, which will be no more of a burden to carry than is the case with a properly installed stoker-fired boiler plant if the cost of repairs, power, etc., is considered.

The developments in the last year or two have been remarkable. The distribution of powdered fuel, or the method of handling it, has been improved to such an extent that it is of virtually equal simplicity with the distribution of fuel oil. By means of an inclosed system of small pipes cleanliness and great efficiency have been insured. It may be said that the distance between the milling plant and the boiler house can be quite disregarded up to half a mile and probably more.

The ash and clinker troubles to which you refer no longer exist. Some boilers are operating continuously two or three weeks, day and night, before the furnaces are even cleaned from slag, and then the time required to clean a 500-hp. boiler is only six man-hours.

The use of pulverized fuel for boiler plants is here to stay both for small industrial plants and, in a more advantageous way, for larger ones, as public service and other power houses.

FREDERICK A. SCHEFFLER,
Manager Power Department.
Fuller Engineering Co.,
New York City.

[We agree with Mr. Scheffler in his statement that the use of powdered fuel is growing by leaps and bounds. Remarkable efficiencies have been obtained and ash and clinker troubles are being overcome. However, the point which we made in the editorial of Jan. 28 has been missed. It was that no data of any consequence had been made extensively available to central-station engineers on detailed operating costs under normal operating and load conditions, nor on maintenance expense nor on the methods of overcoming such operating problems as have become associated with powdered-fuel combustion in the past. If some more comments from users like those which have appeared in ELECTRICAL WORLD by E. B. Powell, Stone & Webster, Inc., and John Anderson, Milwaukee, are made available, the purpose of our editorial will have been accomplished.—EDITORS.]

Preparing Engineering Students for the Industry

To the Editors of the ELECTRICAL WORLD:

Education and graduate student problems seem to be live topics just now in your columns. G. H. Stickney presented in the March 18 issue a view of the situation with which, though it differs from the usual one, I am in practical accord and upon which I trust you will permit me to enlarge. As I analyze Mr. Stickney's letter I note several leading ideas:

1. There is an oversupply of men trained for designing.
2. There is a strong demand for technically trained men to fill executive and commercial positions.
3. There is a dearth of the commercial and executive type in the ranks of engineering graduates.
4. It is difficult to remodel the man after graduation.
5. It should be possible to train the desired commercial-executive-engineer type in schools.
6. Few schools are attempting the job.

It will interest Mr. Stickney, I know, and every one who reads this, I hope, to learn that the Carnegie Institute of Technology is doing the very thing which is so strongly urged in the article mentioned. It is not a new venture and is beyond the experimental stage, having been begun many years ago as a three-year non-degree course, but since 1919 it has been on a four-year basis with standard entrance requirements and an undergraduate curriculum of a pitch equal to other courses leading to a degree of B. Sc. The course is entitled "electrical equipment and construction." The usual standard courses in electrical engineering and commercial engineering are also offered, and it must not be inferred that these have been superseded by the one under discussion or that the latter is a substitute course or merely an option. Electric equipment and construction is a major course, one of a group which are sometimes referred to as "training for executives" and which cover many subjects knowledge of which is essential to an executive or a proprietor-manager. In addition to the fundamental scientific and cultural subjects which are essential in any major electrical course, the following among other studies are included in the curriculum: Economics, industrial history, modern industries, psychology, personnel work, principles of selling, advertising, employment problems, accounting, credit and banking, business law and specification and contract writing. To give the course the desired vocational trend, a place is accorded to several special electrical subjects, such as underwriters' and city electric codes, estimating from plans, shop practice in electric wiring, installation and maintenance methods, winding and repair, storage-battery practice, illumination and photometry.

The inception of the course was due to the realization by those responsible for it of the existence of the six fundamental conditions above mentioned. There are many young men who by temperament are unfitted for the work for which most electrical engineering courses now prepare them but who none the less would be happy and successful in other fields which the electrical industry affords but for which there is very little special training available. It was believed that the central-station and other operating companies, large industrial concerns, the jobbing and supply interests, contractors and dealers and the commercial divisions of manufacturing companies all needed technically trained men prepared to engage in the work of sales, installation, operation or maintenance.

If the student pursues a course in which machine design and manufacturing principles and processes are strongly featured, it is natural that he should upon graduation endeavor to enter the field of design and the technical end of manufacturing, regardless of economic and working conditions and of his aptitude for this branch of the business. It is not intended to disparage the older training or unduly to laud the newer, but to emphasize the fact that a great field has been overlooked by those responsible for most engineering courses, in consequence of which many young men laboriously train for work which they will never perform and after graduation go through a painful process of readjustment to work for which their college course did not prepare them.

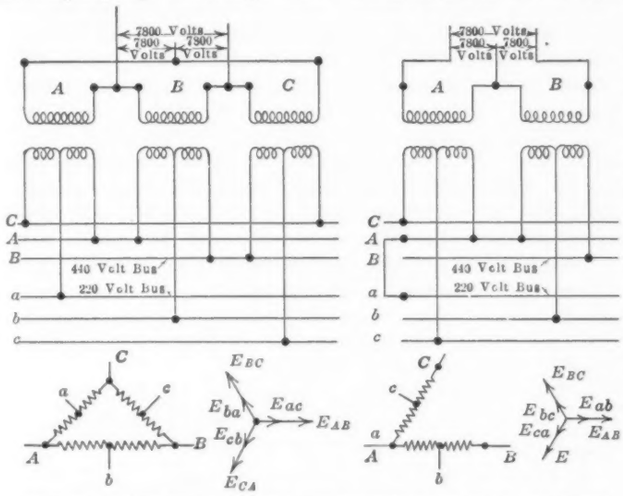
H. A. CALDERWOOD,
In charge of Electric Equipment
and Construction Department.
Carnegie Institute of Technology,
Schenley Park, Pittsburgh, Pa.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Two Voltages Obtained from Single Bank of Delta-Connected Transformers

TWO voltages are obtained from a single bank of transformers at the Brooklyn Bridge Freezing & Cold Storage Company, New York. As shown in the accompanying drawing, three single-phase, 250-kva., 7,800/440-220-volt oil-insulated, self-cooled transformers are connected in delta. The middle points of the secondary windings are brought to a secondary bus.



BECAUSE OF THE TWO VOLTAGE CONNECTIONS ON TRANSFORMERS INDIVIDUAL COMPENSATORS FOR MOTORS ARE NOT NEEDED

Left—Three transformers connected in closed delta. Right—Connections to be made for open delta should one transformer be damaged.

The 220-volt bus is used to operate auxiliaries and also for starting three 440-volt, 250-hp. synchronous motors and two 440-volt, 50-kw. synchronous motor-generator sets, thus doing away with individual auto-transformers for starting these motors. Both the 220-volt and the 440-volt buses are permanently tagged as shown in the diagram, so that the same direction of rotation is obtained by connecting the motor leads to the bus having the same marking.

From a vector diagram of the voltages we see that the 220-voltage is not in phase with the corresponding phase of the 440-volt side, but is 60 deg. behind or ahead as we care to view it. The actual kilovolt-ampere capacity of the bank is, therefore, slightly reduced, depending on the 220-volt load, but the advantages obtained far outweigh this slight disadvantage up to a 220-volt load of about 20 per cent of the ampere capacity of the bank. That is, the amperes at 220 volts should not exceed one-fifth of the ampere capacity of the bank at 440 volts, as all the load taken from the 220-volt connection is equivalent to the same load on 440 volts at a lower power factor. If the 220-volt load is larger than 20 per cent, then a different arrangement is to be preferred.

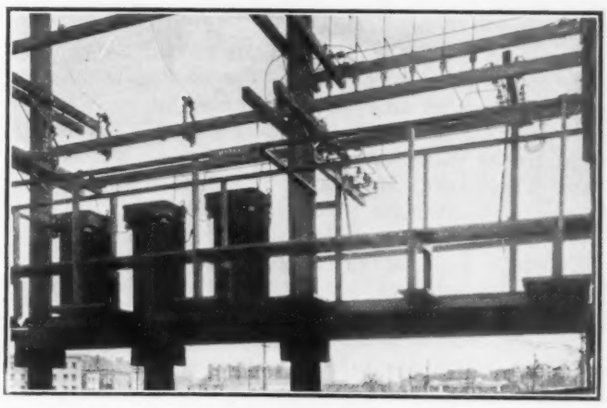
In case of breakdown on one of these transformers, it can be cut out of service and the two others operated on open delta. The capacity of the bank is such that when operating on open delta the bank is just capable of carrying the normal load of the plant. The extra cost of operating the bank in closed delta at the lower load and efficiency is found to be less than the interest on the investment of a fourth transformer kept as a standby.

To illustrate, assume, in case of a breakdown, that any transformer is damaged; then it will be necessary to make new connections as follows: The 440-volt bus that connects to the common point of the two transformers is connected to the 220-volt bus of the same letter, that 220-volt bus being disconnected from the transformer to which it was originally connected. The 220-volt bus connected to the damaged transformer is then connected to the transformer from which the 220-volt bus was removed to make the first connection. The change can be made in a few minutes and does not change the direction of rotation. A specific case where trasformer *C* is damaged and transformers *A* and *B* are operated on open delta is shown on the right in the illustration.

EUSTACE C. SOARES,
Ophuls, Hill & McCreery, Inc., Electrical Engineer.
New York.

Substantial Outdoor Construction for Light Load Centers

RUGGED outdoor pole-type construction has been adopted by the Northwestern Electric Company of Portland, Ore., for use in lightly loaded distribution centers. The modern erections are of a substantial kind, allowing great freedom in extension and maintenance. This type of substation is inexpensive and readily lends itself to large expansions in the load. The stations are complete with switching arrangements for shunting the apparatus in case of necessity.

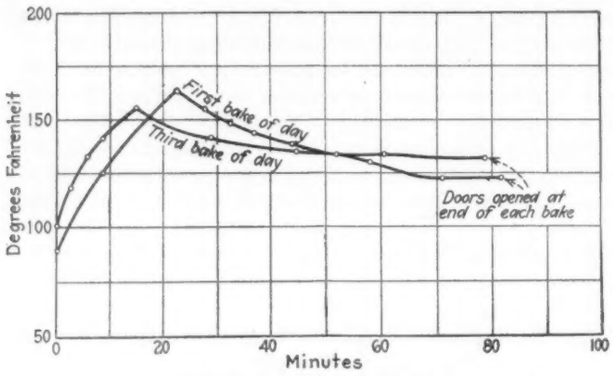


WOOD-FRAME OUTDOOR SUBSTATIONS PROVE ECONOMICAL

Northwestern Electric Company, S. F. PEARSON,
Portland, Ore. Engineer.

Electric Ovens Dry Paint on Light Metal Ware Satisfactorily

AN OPERATING economy in drying paint on light metal ware of 12 lb. to 60 lb. per kilowatt-hour, the extent of the saving depending upon the bulkiness of material handled and the time of day, has been obtained in the factory of the Schleuter Manufacturing Company, 4616 North Broadway, St. Louis. This factory contains three electric ovens used for drying colored paints at temperatures varying from 160 deg. to 270 deg. Fahr. These ovens have taken the place of large gas and low-pressure steam ovens because of their speed, cleanliness and even heat. The materials handled consist of dustpans, water coolers, bread boxes, small metal tubs and similar sheet-metal products. With fuel-fired ovens it is usually necessary to keep the material in the open air for a considerable length of time after removal from the oven to permit the paint to harden, but this is not necessary with electric heat. The improvement in production obtained by the Schleuter company has been so thoroughly satisfactory that it plans to use electric heat for a



OPERATING CURVES SHOW THAT TEMPERATURE DROP IN OVENS IS SMALL

number of other purposes. These ovens are usually operated about eight hours a day, although both day and night operation are sometimes necessary. In that case even better economy is obtained.

The ovens are of the standard box or kiln design with large double doors at one end. The loading is done by hand, either with long wooden frames for such equipment as dustpans or with large, light-weight wooden or metal trucks which can be wheeled in and out of the oven. These ovens are heated by standard air heaters, which are placed in the lower side walls of the oven.

The largest oven installed has a capacity of 36 kw. and operates at a baking range of 270 deg. to 450 deg. Fahr. Four inches of heat-insulating material covering all sides has been built into this oven. This oven does black and color work at the higher temperatures and has automatic temperature control. Each oven is loaded the first thing in the morning, and then the current is turned on immediately. The first bake will take about one hour and twenty-five minutes to meet the maximum temperature, when the doors can be opened and the charge removed. Succeeding loads in the oven will require about an hour to reach the maximum temperature. The average weight of metal dried in this oven when handling dustpans is 432 lb., producing an electrical efficiency for this operation of 12 lb. of metal dried per kilowatt-hour.

The two other ovens are of 27-kw. capacity each and are used for light color work at temperatures varying from 150 deg. to 180 deg. Fahr., and they are accordingly constructed with only 2 in. of heat-insulating materials on all sides. They are hand-controlled and require little attention as they come up to their necessary temperatures very quickly and can be cut off by hand, the bake soon cooling down sufficiently to allow the doors to be opened.

The ovens are equipped with safety switches so that when the doors are open it is not possible for current to flow into the heating element. Bulky equipment placed in these ovens is mounted on light trucks, and as the drying takes place at a low heat, the desired temperature is very quickly reached. With color work on water coolers or bread boxes a temperature of 150 to 170 deg. Fahr. can be obtained in about twenty minutes. The current is turned off, and the material remains in the oven until it has been there a total time of two hours. Electrical efficiency of these low-temperature ovens will vary from 20 lb. to 60 lb. per kilowatt-hour, depending upon the bulkiness of the material handled and the time of the day at which the bake is performed. The afternoon work in these ovens requires very little electrical energy, since the ovens retain sufficient heat to keep them at about 100 deg. Fahr., and the increase in temperature from 150 deg. to 170 deg. can be quickly and economically obtained. The accompanying time-temperature chart shows the performance of one of these ovens with a typical load. Power for operation of the ovens is obtained from the distribution circuits of the Union Electric Light & Power Company.

JAMES W. CARPENTER,
Industrial Heating Engineer.
Union Electric Light & Power Company,
St. Louis, Mo.

Ring-Lubricated Bearings Should Not Be Neglected

REGULAR inspection of the oil rings on generators, converters or motors should be made by the operator to determine if they are turning properly. This is especially necessary when a machine is started up, as the rings are apt to stick at this time. The fact that the oil need be changed only once or twice in a year does not necessarily imply that the bearings are foolproof and need no attention on the part of the operator. If the rings stick and fail to revolve, the bearing will get no oil. This frequently happens, resulting in an overheated bearing and sometimes in enforced shutdown of the machine.

Consequently it is an important duty of the operator to make regular inspection of these rings to see that they are turning. If they are not, they should be started with a small hardwood stick which should be kept on hand for this purpose. At the same time, the operator should see that the gage glasses on bearings are at least half full of oil and that there is no leakage around the glasses. In case of any apparent leakage, lack of oil or chronic sticking of any particular oil ring, the matter should be reported to the foreman. When inspecting oil rings on a running rotary, operators should wear goggles to protect their eyes from possible flashovers.

The foregoing instructions are given to operators of the Consumers' Power Company.

Chicago, Ill. FIELD EDITOR ELECTRICAL WORLD.

Adapting Standard Reflectors and Guards to New Type of Mill Lamp

SOME engineers may have experienced difficulty when replacing standard lamps with the new mill-type tungsten lamp in standard guards and reflectors. This type of lamp has a ring filament which is mounted closer to the lamp base than the filament in the older types of lamps. The bulb shape is also new. Because the source of light is held higher up inside the reflector the light is concentrated directly under the reflector and covers a small area. In many cases this is objectionable. In addition, the reflector efficiency is materially decreased because the light is pocketed in the neck of the reflector. The dotted curves of the accompanying illustrations show this concentrating effect with four types of reflectors.

By using a standard 1⅛-in. socket extension in each of the reflectors shown the light center is brought farther down in the reflector near the normal position for which the reflector was designed, resulting in a distribution of light almost normal, as shown by the solid-line curves, and the reflector efficiency is also appreciably increased, as shown in the following table:

Reflector Using New Mill-Type Tungsten Lamp	Reflector Efficiencies without Socket Extension, Per Cent	Reflector Efficiencies with Socket Extension, Per Cent
Porcelain-enameled shallow dome...	58	76
Porcelain-enameled bowl	46	61
Aluminum-finish bowl	39	50
Light-density opal bowl	69	80

Many of the wire guards now in use were designed to fit the old 16-cp. and 32-cp. carbon lamps, and in many cases when the new mill-type lamps are put in these guards the pear-shape bulb touches the strands of the guard near the holder ring. To be effective the outer strands of the guard should clear the bulb so that knocks and shocks may be absorbed by the guard rather than transmitted to the glass. In most of the cases where the guards touch the glass near the neck it is possible to bend the wire strands to clear the lamp. However, when the guards have very heavy strands, confining collars or cast half-reflectors as a part of the guard, it is the best plan to adapt the lamp to the guard by using the same socket extensions suggested for the reflectors. Many of the wire-guard manufacturers have designed or are designing new guards to fit this lamp.

National Lamp Works,
General Electric Company,
Cleveland, Ohio.

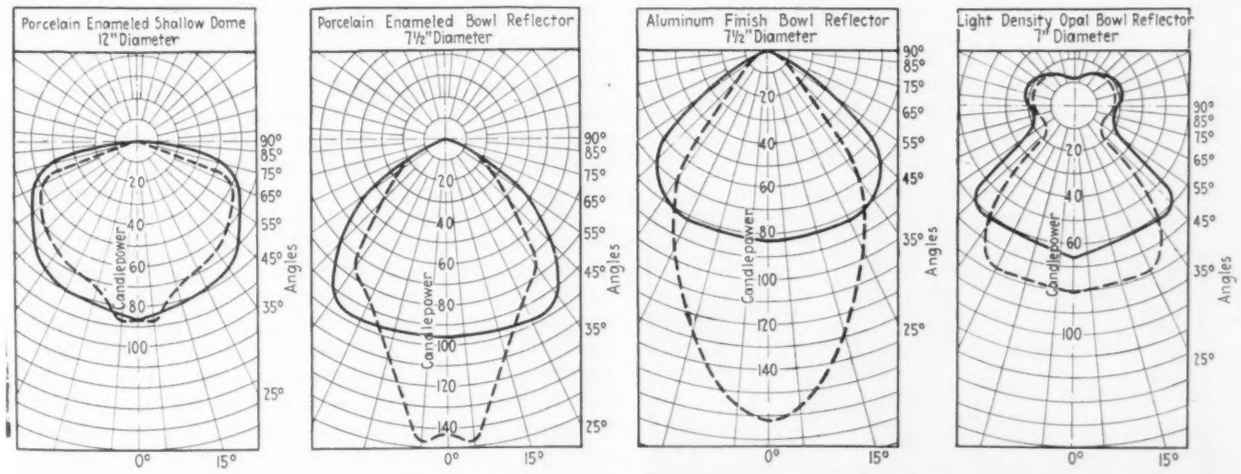
JAMES M. KETCH,
Illuminating Engineer.

Successful Handling and Storing of Hogged Fuel

HANDLING and storing of sawmill refuse or hogged fuel for central-station power generation is a matter that has confronted many companies desiring to make use of this low-grade fuel. At least two companies in the Northwest have successfully solved this problem, one being the Portland (Ore.) Railway, Light & Power Company. The method employed by this company for generating power from waste was described on page 373 of the ELECTRICAL WORLD for Feb. 25, and the manner in which the fuel is handled and stored by drag rakes and conveyors may be seen in the accompanying illustrations.

FIG. 1—RAKE USED TO PILE UP HOGGED FUEL

The means for handling hogged fuel, while seemingly crude and laborious, are best adapted to this purpose on account of its bulk and low heat content. This fuel carries water to the extent of about one-half its weight,



BY USING STANDARD EXTENSION SOCKETS WITH THE NEW MILL LAMPS UNIFORM LIGHT DISTRIBUTION IS INSURED

The distribution of light without the extension socket is shown in each case by the dotted lines. As the source of light is held higher up inside the reflector, the light is concentrated to a small area directly under the reflector. When the standard 1⅛-in. extension socket is used the distribution of light is brought back to normal as shown by the solid lines.

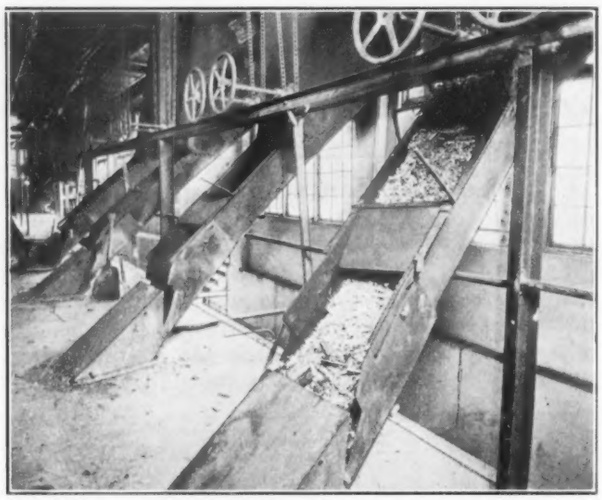


FIG. 2—FUEL DISCHARGED FROM CONVEYOR TO DUTCH OVEN BY CHUTES WITH HANDLE-WHEEL CONTROL

and its bulk is three or four times an equivalent weight of coal and approximately nine times the bulk of coal when based on heating values. Consequently the expensive and highly efficient system of gantry cranes, larries, automatic weighing hoppers, etc., which goes to make up the equipment of a modern coal-storage plant would not justify the investment when applied to hogged fuel.

The manner of building up the storage piles may be seen by the diagrammatic arrangement of the storage rigging shown in Fig. 4, which is the latest development of the system employed by this company. The drag rake (Fig. 1) is attached to the drag lines *A* and *B*, so that it may be pulled in either direction by a double drum logging engine or hoist engine. These lines pass through snatch blocks, C_1, C_2, C_3 and C_4, of which C_1 and C_4 are placed permanently at the ground level and act as guide blocks to carry the drag lines to and from the winding drums of the engine. To change the position of rake travel, block C_3 may be shifted to any one of the stub poles. These poles are about 15 ft. high, set in the ground around the edge of the pile and securely braced by guying. Block C_3 is attached to two drag lines, *D* and *E*, which are carried by means of snatch blocks to a small double-drum hoist in the same manner as the rake lines are handled. By means of these lines block C_3 may be moved across the fuel pile in a path approximately at right angles to the path of the rake.

In storing the fuel it is deposited at a point near the edge of the pile by an overhead conveyor. The drag lines are then arranged so that as the engine is operated the rake is pulled back and forth from the point where the fuel is deposited by the conveyor up over the fuel pile. With each forward movement the curved teeth of the rake pick up from 60 cu.ft. to 100 cu.ft. of fuel and carry it to any part of the pile. The motion of the rake is then reversed, and the curved teeth allow the rake to slide backward over the pile without picking up or displacing any fuel. By a proper manipulation of the lines controlling the position of block C_3 the path of travel of the rake may be changed and the top of the fuel pile built up in any desired manner.

When the fuel is to be reclaimed the rake is operated in a similar manner, the forward motion carrying a rake full of fuel to a conveyor installed near the ground at one edge of the pile and the backward motion carrying the empty rake up to get a fresh supply. This conveyor consists of a link chain with cross-bars at intervals. It carries the hogged fuel over the Dutch ovens of the boiler room, into which it discharges the fuel through chutes, as shown in Fig. 2.

Two men, a drag operator at the hoists and a signal man on the pile, furnish all the labor needed to operate

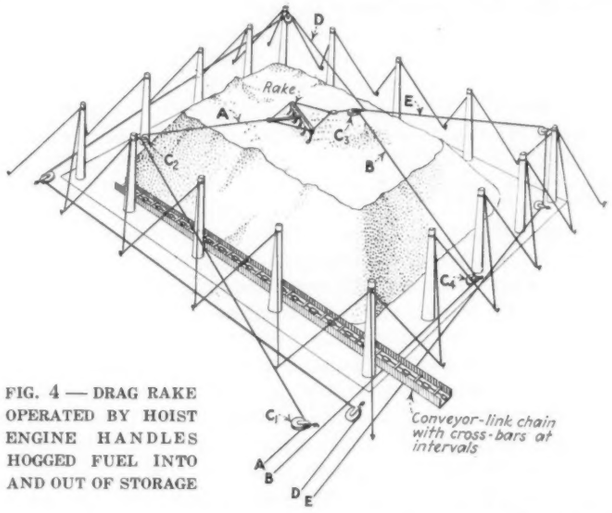


FIG. 4 — DRAG RAKE OPERATED BY HOIST ENGINE HANDLES HOGGED FUEL INTO AND OUT OF STORAGE

the storage equipment. Sometimes in reclaiming fuel a third man is required to watch the conveyor that takes the fuel away. Two men can handle from 40,000 cu.ft. to 60,000 cu.ft. of fuel per eight-hour shift, the exact amount depending on the size and shape of the pile and the speed of the hoist engines. The steam hoists formerly used for this work are being rapidly replaced with electrically driven machinery.

A barge-loading conveyor that has proved itself especially effective in handling hogged fuel is shown in Fig. 3. It consists of a short extension conveyor, with a receiving hopper and discharge spout, mounted on a truck that moves back and forth on a dock track. It is therefore possible to shift the conveyor over the barge while loading and later to draw it back of the dock line to clear river traffic. The loader is moved back and forth to load the barge evenly and to prevent listing. At the same time the barge is moved along the dock under the loader by means of a small electric winch. It is highly important to keep the barge on an even keel since any tendency to list will be increased by a shifting of the fuel.

H. S. BASTIAN,
Assistant Construction Engineer.
Portland (Ore.) Railway, Light & Power Company.

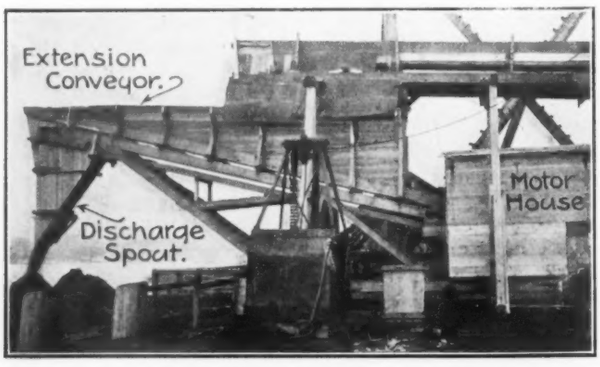


FIG. 3—CONVEYOR PLACED ON TRACKS LOADS BARGES EVENLY

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

An Experiment in Building Local Harmony

By A. M. Wilson
Professor Electrical Engineering, University of Cincinnati, and Chairman Grievance Committee, Electric Club of Cincinnati

THERE is an instructive story in the record of the part played by the Electric Club of Cincinnati in developing and maintaining harmonious relations among the electrical fraternity in Cincinnati. In the fall of 1921 conditions were such that the newly appointed management, in looking over the situation, was confronted with the problem either of assuming responsibility for advocating the abandonment of the club as an organization or of establishing it in such a way that it would have a real purpose and render a constructive service. After much deliberation it was decided to call a meeting of those who had shown an interest in the organization for consultation regarding future plans. It was the consensus of opinion that one more vigorous effort should be made to meet the situation.

There were three problems which apparently needed attention. The first and most important one was due to a feeling on the part of a number of electrical contractors that they were being discriminated against in the awarding of contracts for wiring houses. The second problem was the result of belief on the part of some of these contractors that the central-station company's solicitors, who went out securing contracts for the wiring of old houses, were using arguments which put the contractors at a serious disadvantage. The third problem was one affecting both the contractors and the jobbers and had to do with the financing of selling electrical devices on the installment plan and the sale of incandescent lamps. In all three of these problems the policy and practice of the local public utility were vital factors.

At the meeting which was held under the auspices of the newly elected management of the Electric Club in the fall of 1921 the various problems of the industry were reviewed, and it was suggested that a small committee be appointed which would take them up and see if a means could not be found to bring about a feeling of confidence and co-operation between the contractors involved.

A committee of three, known as the grievance committee, was appointed, consisting of one contractor, one jobber and one disinterested person who was at the same time familiar with the local situation. The first problem which was attacked arose from a complaint on the part of several of the contractors that they were unable to get meters installed as promptly as the contractor who had taken over the central-station company's wiring business. The committee met in President Freeman's office. There were present, besides Mr. Freeman and the committee, Mr. Hubbell of the Underwriters' Inspection Bureau, Superintendent Healey of the distribution department and Mr. Heed, the general manager of the Union Gas & Electric Company.

As a result of this meeting it was agreed that any reputable contractor who had demonstrated to the satisfaction of the Underwriters' Inspection Bureau that he would comply with the Underwriters' requirements in every case should have exactly the same sort of service as was given to the contractor who had taken over the company's wiring business. It was agreed that it would be impossible to extend this privilege to all the local contractors, because, on account of the activity of the company, a number of so-called curbstone contractors had sprung up concerning whose business methods and wiring practice the local inspection bureau could not have complete information. The solution arrived at was entirely satisfactory to the local contractors and met that particular grievance completely, so far as the committee has been informed.

The second question which the committee had to consider involved reports that the company's solicitors, in seeking contracts for the wiring of old houses in competition with the solicitors of the contractors, were obtaining their contracts by unfair means and were professing to offer advantages which contractors in general could not. A number of apparently specific cases of this kind were presented to the committee, but on investigation it was brought out that they were in reality only different versions of a few cases which had been magnified in repetition from one to another.

Grievances Not Worthy Serious Consideration

The committee investigated every grievance of this kind which came to its attention and found not a single one worthy of serious consideration; and it was felt by all who were thoroughly acquainted with the facts that if the contractors had put forth the same amount of energy in soliciting business and in selling wiring devices that they had in enlarging upon the reports of the shortcomings of the company's solicitors they would have been much happier and much better off financially.

There are one or two other matters which may be taken up in the future if it appears that the welfare of the local electrical interests will be advanced by doing so, but there can be no doubt that the work of the grievance committee up to the present time has been of sufficient value to the local electrical interests to justify the effort put forth. There are a great many schemes which are impracticable but in the discussion of which facts are brought out which are of real value. In the case of the grievance committee, if nothing more is accomplished than has already been done, its organization will have been more than justified. Indeed, it seems obvious that, particularly where such a condition prevails as was present in Cincinnati, the mere existence of such a committee serves to promote a feeling of confidence, and therefore of co-operation, among the various interests that should work together.

A Building Contractor's Appreciation of the Electrical Home

WHAT is probably the first instance of a general installation of radio-telephone service in new houses is seen in this advertisement of a Philadelphia building contractor. This builder is one of the foremost promoters of building operations in that city and makes it a point that every new development of merit shall be incorporated in the houses. Here is another step toward the complete electrical equipment of the home—one which shows the importance which contractors and real-estate men attach to these conveniences.

Announcement—

Radio Telephone Service Built in These New Homes

The $1,500,000 worth of new homes which we are now building in West Philadelphia, Germantown, Wynnefield and Cynwyd will be **EQUIPPED COMPLETE** with Radio Telephones, connecting with concert service from Pittsburgh, Newark and other centers. This will add greatly to the enjoyment and comfort of these new homes.

JOHN H. McCLATCHY
Builder of Homes
848 Land Title Bldg.

MAKING RADIO SERVICE PART OF HOME EQUIPMENT

A Rate Decrease Makes Graphic Window Display

TO BRING home to the public what its new residential rate means in the way of reduced costs of lighting and appliance service, the Hartford (Conn.) Electric Light Company recently ran these interesting window displays, in which the costs of operating lamps and appliances on the old and new rates were compared diagrammatically. Streamers run from lamps of different sizes to the old and new points on the rate chart helped to focus attention on the savings resulting from the new rate, the area between the old and new rate lines also being featured as an integrated saving. Tabular data on appliance operating costs showing the saving per hour in operating different devices were shown on one chart, with the extent of additional use the new rates permit without increasing the former bills.

The new rate which went into effect on Jan. 1 is a combination flat rate and meter flat rate with a charge of 5 cents a month per 100 sq.ft. of floor area plus 6 cents per kilowatt-hour, as explained in the ELECTRICAL WORLD for Dec. 31, 1921, page 1341. R. D. Cutler is sales manager and G. P. Luscomb is appliance manager of the appliance department at Hartford.

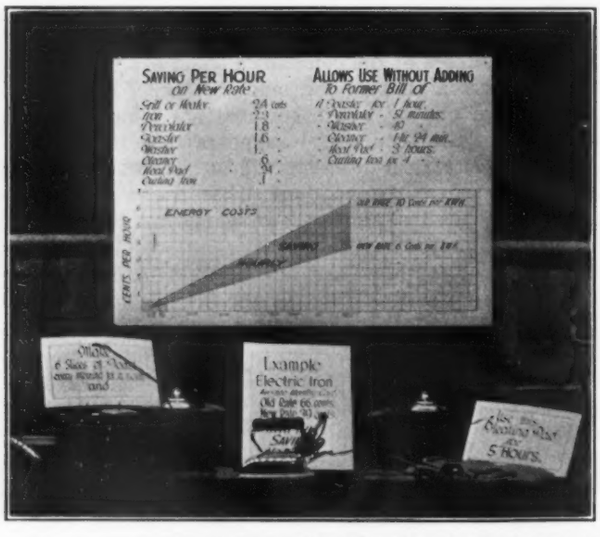
What Other Companies Are Doing

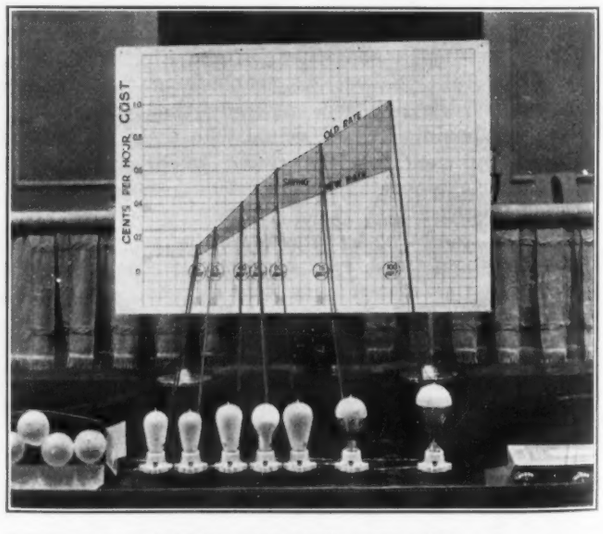
New England.—Appliance sales in nine electric utilities under the management of Charles H. Tenney & Company increased from $44,376 in the first quarter of 1921 to $52,841 in the corresponding quarter of 1922. The number of appliance units sold increased by a larger total. In eleven Tenney companies the number of meters set in the first quarter of this year was 847, against 736 for the same period a year ago. Cyrus Barnes, general sales manager, attributes these gains to vigorous continuous campaigning for new business and wiring. April, 1922, will show further gains when analyzed.

Oklahoma City, Okla.—Classes for the study of power-plant engineering have been formed by the employees of the Oklahoma Gas & Electric Company. These classes are conducted as round-table discussions, and at the first meeting, on April 18, about twenty men attended. This course is being conducted by E. E. Hunter and W. J. Brown of the company's power-plant department.

Salt Lake City, Utah.—Salt Lake City's second electrical home is now in course of construction and is expected to be ready for opening about June 15. The manager of the Mine & Smelter Supply Company is building the house for his own use, but has granted permission to the Rocky Mountain Electrical Co-operative League to exhibit it as a model electrical home.

Worcester, Mass.—In March, 1922, the Worcester Electric Light Company installed 708 residential, 97 commercial, 17 power and 14 heating and cooking services, the total meters in use being 36,712, compared with 33,176 a year ago. Vigorous sales efforts by the appliance and other sales departments are yielding fruit, and local interest in house-wiring opportunities has become very active.





TWO CHARTS SHOWING GRAPHICALLY THE SAVINGS EFFECTED BY HARTFORD COMPANY'S NEW RATE

Manufacturing and Distributing

Devoted to the Discussion of Production, Distribution and Market Development, the Business and Economic Problems of the Manufacturer, Jobber, Agent, Contractor and Dealer

Why Should We Chase Prices Down the Spiral?

BY LE ROY CLARK
President Safety Insulated Wire & Cable Company, New York, N. Y.

PRICE has become entirely too great a factor in the sale of a number of important lines of electrical material. The reduced volume of business during the period of depression following the war has built up a degree of competition that has deteriorated into a contest in which the cutting of prices has become too conspicuous a feature, and the cutting of prices never yet created or stimulated business. As a result the tone of the market is off. You find the manufacturers of these products even yet saying that "business is rotten" and deploring conditions, in spite of the fact that building construction is increasing steadily and the demand for their goods improving very noticeably. In other words, this trouble that is bred of unprofitable and unreasonable price competition is an artificial condition within the power of these manufacturers themselves to restore to a healthful balance.

LE ROY CLARK

What causes these falling prices in the face of increased demand? An illustration from the insulated wire industry may give the answer. A salesman representing Wire Manufacturer A calls upon a customer who is in the market for a few thousands of dollars' worth of wire and quotes him $5.85 per 1,000 ft. He returns later to see if he is to get the order, and the customer says, "No, I bought it from Manufacturer B at $5.80." The salesman from Manufacturer C is told the same thing, and what does he do? Does he say, "Well, we can't get them all," and hustle on and get orders from the next man? He does nothing of the sort. Both he and the salesman for Manufacturer A wire or telephone immediately to their respective sales managers and say, "We must have a price to beat Wire Manufacturer B, who is selling at $5.80." Back comes a wire, "Make the price $5.75."

The next thing that happens is that the salesman for Wire Manufacturer B loses a sale to Wire Manufacturer A on the new cut price, and he wires in to his sales manager, "Wire Manufacturer A selling at $5.75. Must have a price to beat." He then receives authority to sell at $5.70, and so it goes. Each salesman thinks he must be able to compete on price for every order, and the weak sales manager is so determined to "hog" the business he meets each appeal with a new reduction. The result is a progressive spiral of prices downward.

If these figures, these new prices, were based on cost, it would mean something, but they are not. They are simply moves in a game of price politics, and while the manufacturer is worrying and grumbling over poor business, he is, in a misguided eagerness to get more orders, continuing and intensifying a predicament of his own making. Because his profits are small he concentrates his selling force on getting more business, and to get more business he still further reduces his profit by cutting prices, as though price were the only thing he had to offer to his trade.

TWO COURSES OF ACTION

There are two courses of action which would, in my opinion, materially help this deplorable condition. In the first place, the manufacturers must stop being afraid to lose an order. The other fellow must have some business. He is entitled to it. He *must* get it to live, and he is going to get it. And, after all, there is, always has been and always will be business for all whose sales policies are properly balanced to provide real service to the market. This bit of practical business philosophy must be thoroughly implanted in the mind of every salesman. The loss of an order because some one wants to quote a "fool" price is no reason for discouragement, when there are other orders to be had from other customers. Besides, there are many other elements than price in the value of a commodity. Has he nothing to say of his quality and of his service?

The second point is this, that no manufacturer should lower a price to meet competition without careful investigation. Prices ostensibly are set in accordance with cost and to provide a fair margin of profit, and it should take more than a telegram from a faint-hearted salesman, based on the statement of a purchasing agent announcing that some competitor has cut under this price, to influence the manufacturer to sacrifice this proper profit. Too often it is not the voluntary act of the competing manufacturer that starts the price spiral on its downward way, but the chance act of some salesman who weakens at the test and gives a lower price to some favored customer or some "prospect" whom he is overeager to win. Therefore every case should be investigated and the facts ascertained before cutting prices. If the salesman will learn to smile when he meets a cut-price competition and go his way and sell to somebody else, and if the sales manager will learn not to be smoked out by some fearful salesman's clamor, much of this trouble will be ended.

In a word, be willing to lose an order now and then. Don't, in the absence of facts, believe all the bad you hear about your competitor. And, above all things, don't make prices that will give your stockholders reason to question your fitness to handle their money.

Mass Production Important Factor in Future Transformer Prices*

BY M. O. TROY
Manager of Transformer Sales, General Electric Company

TO ACHIEVE much success in the further reduction of transformer prices, we must look to mass production resulting from standardization. Purchase price bears directly upon investment charges in transmission and distribution systems, and for this reason its study is important in analyses of operating costs and engineering developments. At the same time, the prices of modern transformers are remarkably low in comparison with the cost of other electrical equipment.

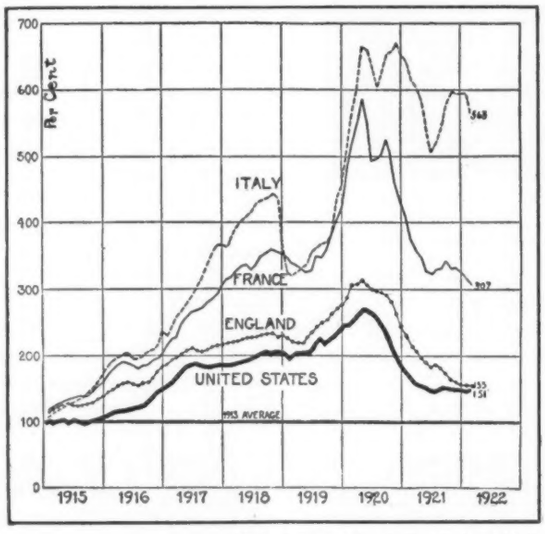
When one takes the total costs of installed apparatus, such as the hydraulic development, the power station, the line and distribution system, or the steam plant and all that follows thereafter, and figures this per kilovolt-ampere, the costs of the power transformer can hardly be found in the sum. Were it necessary to spend on power transformers three or four times the amount expended today in order to obtain present results, the investment costs would not be seriously affected. Particularly with distribution transformers, the manufacturer's profits on an individual sale are small. He looks to his turnover for profits, realizing these through selling a large number of units per year.

Through standardization the manufacturer is enabled to concentrate on a production of larger magnitude and in some measure to substitute machine for manual methods of factory operation. This is necessary to offset the increased cost of skilled labor, coal, transportation and other economic factors, which will probably never go back to pre-war levels. As a result of the standardization work accomplished during the past few years, many gains have been made. Before this work was seriously begun something like 8,900 transformer specifications were maintained, and the total number of variations in transformer type, rating, voltage, etc., which could be drawn upon without extreme departures from normal practice was about a million and a quarter. There are now about 3,800 specifications, and this means that larger stocks of the more authorized ratings, etc., can be carried and tends to simplify the work of manufacturer, distributer and user.

Future possibilities of price reduction cannot be as great with the power transformer as with the distribution transformer, because quantity production will never become possible with the former to the extent attainable with the latter. But if such prices are made lower in future, it will come about largely because of the process of standardization and concentration of effort as set forth for the distribution transformer. In purchasing, the user will gain, however, through a closer study of relative prices of power transformers of different ratings and voltages. It is a fact not always appreciated that as voltages rise the cost of providing a much larger kva. rating does not go up in proportion. Thus, for a comparatively small additional investment, the purchaser of an 8,000-kva., 220,000-volt transformer can be furnished a unit of 15,000 kva. or 20,000 kva. rating, on account of the requirements of insulation, mechanical strength and other factors.

*Abstract of a paper presented before the Providence Section of the A. I. E. E.

Wholesale Commodity Prices in Four Countries



(*Federal Reserve Agent, New York District*)

WITH business now definitely on the upgrade this chart offers a large degree of satisfaction to American industry. It shows that in the return to normal or pre-war prices the United States has made greater progress than have England, France or Italy, where the wholesale commodity prices are still 55, 207 and 463 per cent, respectively, above the 1913 average.

The Jobber Should Be Considered a Part of Manufacturer's Organization

BY A PACIFIC COAST JOBBER

THE responsible jobber should receive the same considerate treatment that is given to an authorized agent of a manufacturer if the jobber is conscientiously building up an outlet for the lines he is carrying. This is vitally necessary to encourage the jobber continually to expand his efforts and to repay him for the pioneer and missionary work he has done. The amount of energy and salesmanship put into the development of a given line in a territory can never be repaid the jobber unless he is assured of a reasonable continuity in the distribution of the goods. This assurance would be virtually the same as that given a regular agent of the manufacturer and would enable the jobber to proceed confidently and safely with development work which otherwise would not be justified.

Too many manufacturers lack a proper appreciation of the relation a jobber holds to the industry in building up the business of the manufacturer. Given a quality product, and the successful jobber demands one, the field is cultivated by the direct efforts of the jobber. He must do the necessary missionary work, not only among the electrical contractors but also largely among the architects, builders, general contractors and industrial establishments. Such work costs money, but if it is well done the manufacturer's line is firmly established. Right then comes the crux of the situation. Will the manufacturer appreciate the good work that has been done and give the jobber his continued support, and will he have confidence that the jobber is in fact pushing the distribution of his materials to the reasonable limit, or will he become greedy for still more rapidly increased sales and try to effect this by dividing the distribution of his goods among several jobbing concerns serving the same limited territory?

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

A Million-Volt Testing Transformer.—J. F. PETERS.—The design and construction of a million-volt transformer is given. The problem of obtaining the proper installation protection in this type of transformer is discussed.—*Electric Journal*, March, 1922.

Theory of the Two-Phase and Three-Phase Generators.—G. SHIMIDZU and K. ITO.—In this mathematical paper the authors, by seeking complete solutions of fundamental differential equations, determine the instantaneous value of current subjected to sudden change of load in general. As an illustration of this method the value of sudden short-circuit current of a generator is calculated. In conclusion, the results are compared to those obtained by the usual methods that have been employed previous to this time. These calculations are made with the assumptions that the poles are non-salient, that the entire iron core is finely laminated and that the wave form of flux produced in both the armature and field coil is sinusoidal.—*Journal of the Institute of Electrical Engineers of Japan*, March, 1922.

Lamps and Lighting

The Elements of Good Foundry Lighting.—J. M. SHUTE.—An evaluation of the factors which are considered in the solution of foundry lighting requirements is given with practical suggestions for the maintenance of the equipment. Investigations have shown that three governing factors determine the lighting requirements. First, the dust and gas in the atmosphere and the film of dust which adheres to all objects make it necessary to use equipment which does not depend upon the walls and ceiling for reflection but directs its light toward the work. Second, although the work appears to be of rough nature, lack of proper illumination often results in imperfect molds from which good castings cannot be obtained. Third and most important is the safety element. The lighting system becomes a form of insurance on the business and should not be neglected because of an erroneous belief that it is unimportant.—*Electrical Review and Industrial Engineer*, April, 1922.

Generation, Transmission and Distribution

La Basse-Isère Hydro-Electric Plant.—A. DUMAS.—Situated on the Isère River, this new French hydro-electric plant utilizes a head of 10 m. obtained by damming the river and constructing a canal 1,600 m. in length and a tailrace of 500 m. Seven 5,600-hp. vertical-shaft, single-runner Francis turbines of 107 r.p.m. are directly connected to seven three-phase generators of 4,000 kw. (70 per cent power factor) at 50 cycles and 5,500 volts to 6,200 volts. An 85-kw. exciter unit is keyed to the end of the main shaft. An outdoor transformer station has been built for the transformation of the generator voltage to the line voltage, which is 120,000. This is the first outdoor transformer station of such large output and high voltage in France. There are twelve single-phase transformers of 3,333 kva. arranged in Y-groups with grounded neutral. The high-voltage oil circuit breakers are designed for 400 amp. and a rupturing capacity of 400.000 kva. The 100-km. high-voltage line, unfinished at present, comprises six aluminum cables of 102 sq.mm. cross-section.—*Le Génie Civil*, Feb. 25, 1922.

Tuning of Choke Coils (Part II).—F. NOETHER.—In Europe there are in use chiefly two arrangements for the suppression of dangerous currents in so-called arcing grounds—the Y-point grounding choke coil of Petersen and the phase choke coil of Bauch. The author gives a very comprehensive analysis of these two protective apparatus, explaining mathematically the different conditions which may be expected in using these protectors. The entire problem is a question of the electrical stability or instability of the device, and it is shown that in both cases two stable conditions and one unstable condition can be expected. The mathematical considerations lead the author to the conclusion that it is theoretically impossible to prevent a displacement of the Y-point of a system so protected; but while the Petersen coil may cause a permanent displacement, the Bauch coil, if properly dimensioned, will always restore the original symmetrical phase condition.—*Elektrotechnische Zeitschrift*, Dec. 23, 1921, and March 23, 1922.

Traction

Overhead Construction of the Mittenwald Road.—H. WESTPHAL.—The Mittenwald railway is the shortest route from Augsburg, Bavaria, over Innsbruck, Austria, into Italy. The electrification of the entire road was finished in 1913. This paper gives a detailed description of the Bavarian part of the overhead construction of this road, built complete by the Bergmann works in Berlin. Until the new Walchensee plant is put into service the power supply of the road is furnished from the Ruetz works, near Innsbruck, at 50,000 volts, single-phase, 15 cycles, and transformed to 15,000-volt overhead voltage in three substations along the road. The structural-steel towers have been built at an average distance of 90 m. These support a simple, self-tightening catenary suspension system holding up a 100-sq.mm. profilized ("figure 8") copper wire. Double-bell insulators are used throughout. They show a wet flashover of 90,000 volts. Pin-type insulators with a wet flashover of 115,000 volts hold the 50,000-volt feeders on the main steel towers.—*Elektrische Kraftbetriebe und Bahnen*, Feb. 24 and March 10, 1922.

Regenerative Braking and Single-Phase Commutator Motors.—B. NORDEFELDT.—The author discusses regenerative braking on electric railways, especially from the point of view of the problems which arise when it

is employed with single-phase traction. He points out that regenerative braking is of two kinds, that required as a speed check on long down grades and that required for bringing the train to a standstill.—*Electrician (London)*, March 17 and 24, 1922.

Installations, Systems and Appliances

Energy Distribution of Radiant Electric Heaters.—C. F. WAGNER.—While superficially most heaters have the same general characteristics, a more careful investigation discloses variations in maximum intensity and in heat distribution. The author presents a few comparative tests made upon three representative types of heaters.—*Electric Journal*, March, 1922.

History of Electric Cast-Iron Melting.—W. E. MOORE.—After a short preliminary history this subject is taken up under the headings of metallurgy of electric melting, physical properties of electric cast iron, cheaper character of the charge for electric furnace cast iron, and the electric furnace for chilled iron and malleable iron.—*Paper presented before the American Electrochemical Society*, Baltimore, April 27, 1922.

Electrochemistry and Batteries

The Lead-Hydrate Storage Battery.—A battery of this type has been developed and is now being made by a reputable English firm that has 300 per cent greater capacity—so it is claimed—than any other battery for the same weight. It is also stated that this battery never sulphates and cannot be overcharged or overdischarged. Another claim is that the battery can be charged in fifteen minutes, which, if true, would mean that vehicles propelled by lead-hydrate batteries would have a radius of 300 miles instead of the present limited radius of 50 miles. In a demonstration, after charging this battery for nearly a quarter of an hour at more than 100 times normal rate and discharging at a rate commencing at 500 times the normal charging rate, the plates tested, both positive and negative, showed no sign of injury of any kind.—*Electrical Review (London)*, March 24, 1922.

Cast Iron as Produced in the Electric Furnace, and Some of Its Problems.—GEORGE K. ELLIOTT.—The author reviews the scant literature that is published on the electric furnace as applied to the cast-iron industry. The conditions favorable to the production of cast iron in electric furnaces are discussed, and a preference is expressed for the duplex process with basic-hearth electric furnace. Desulphurization and deoxidization in the electric furnace are described. Problems involving sulphur, oxygen and other gases and impurities are discussed.—*Paper presented before the American Electrochemical Society at Baltimore*, April 27, 1922.

Units, Measurements and Instruments

Investigations of Current Transformers.—H. W. PRICE and C. KENT DUFF.—A study of magnetic leakage and leakage reactance of current transformers and of their effect on core loss and magnetizing requirements due to the non-uniformity of core flux and the resulting effects on the ratio and phase angle. Five papers on current transformers are included in this bulletin. The first is an investigation of flux distribution in the cores of current transformers of different types. Leakage reactance is a result of leakage flux—that is, flux which fails to pass through all the turns of both windings because of the strong opposing magnetomotive forces that result from the two windings. In the second paper a method of measuring ratio and phase angle is given. A description of the method employed and some discussion of errors in measurements from changing turns-compensation due to change in wave form are also given. Several oscillograms showing the wave form of various current transformers are shown. The third paper considers the through-type portable current transformer. This is a quantitative investigation of the variations in ratio and phase-angle errors with changes in position and arrangement of primary conductors in several types of transformers. A method for finding the turn ratio of current transformers without the use of auxiliary exploring coils is the subject of the fourth paper. This method is too inconvenient for commercial use, but has several interesting features. Minimizing the errors of current transformers by means of shunts is taken up in the last section of the bulletin. Here the effects of ratio and phase-angle errors of turns-compensation and secondary and primary shunts of resistance or condensance or both are shown. Copies of this bulletin may be obtained without charge from H. W. Price, Electrical Building, University of Toronto.—*Section No. 4, Bulletin No. 2 of the School of Engineering Research, University of Toronto.*

Telegraphy, Telephony and Signals

Radio Service in Aviation.—P. BRENOT.—An interesting historic article describing the gradual development of radio telegraphy and telephony on aircraft from its beginning in 1910 to the present day. The author suggests closer co-operation between the builders of air vessels and the manufacturers of radio apparatus, because many radio sets cannot be used on planes without considerable reconstruction of the latter.—*Radio-électricité*, March, 1922.

Improving Antenna Efficiency.—M. B. WEST.—The purpose of this article is to discuss the question of what really occurs in an oscillatory circuit, with particular reference to the power factor of an antenna circuit. Consideration of the problem indicates that the antenna system is probably the least efficient part of the equipment that goes to make up a radio station, and it is certain that it can be very greatly improved. Actual oscillograms taken of the plate current in vacuum-tube transmitters show great wave-form distortion, and conclusions drawn from them indicate clearly that the greatest efficiency results when conditions are such as to produce maximum distortion.— *Q S T*, April, 1922.

Miscellaneous

Electrical Engineering Progress and Development.—A collection of short articles dealing with modern equipment and practice in the electrical field. Following is a partial list of the subjects covered and their respective authors: "The Boston-Washington Superpower System," by Prof. L. P. Breckenridge; "The Transmission of Power," by H. W. Buck; "Hydro-Electric Power and Western Agriculture," by D. L. Huntington; "City Transportation," by H. W. Blake; "Electrical Public Utilities," by William McClellan; "Railroad Electrification," by E. H. McHenry; "Electricity in Productive Industry," by F. C. Pratt; "The Telephone Today," by R. W. King; "Illumination and Engineering," by H. V. Bozell; "Radio Broadcasting," by H. P. Davis; "The University and Engineering Training," by E. M. Herr.— *Yale Alumni Weekly*, March 10, 1922.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Philadelphia Electric Offers $7,500,000 in Bonds Yielding 5.53 per Cent

THE great reduction in the price of capital seeking investment in gilt-edged public utility securities was emphasized last week when the Philadelphia Electric Company placed on the market $7,500,000 in 5½ per cent series twenty-five-year first lien and refunding mortgage gold bonds at 99½ and interest, which will make the yield a little under 5.53 per cent. These bonds are callable only for the sinking fund on any interest date, on thirty days' notice, to and including June 1, 1927, at 107½ and interest; thereafter they are callable as a whole or in part and for the sinking fund at 107½ and interest to and including June 1, 1932, and thereafter at a premium of one-half of 1 per cent for each year of unexpired life or fraction thereof.

Railroad Electrification in Mexico

ENGINEERS are making a study of the practicability of electrifying two or more divisions of the National Railways of Mexico. Oil for fuel for the engines must be now hauled from Tampico, and it is asserted that upon the mountain divisions electric power would be much cheaper and more satisfactory than steam. Power may be obtained, it is said, from the plants of the Guanajuato Electric Light & Power Company and the Northern Power Company, which are in proximity to two of the more important divisions of the railroad system. Should it be found, however, that the National Railways of Mexico can obtain cheaper power by constructing their own hydro-electric plants, this may be done, an abundance of water power being available for the purpose, according to the reports of engineers. The main hydro-electric plant of the Guanajuato Electric Light & Power Company is at El Duro, in the State of Michoacan, and the plant of the Northern Mexico Power Company is at Boquillas, in the State of Chihuahua.

Springfield (Ohio) Rate Dispute Settled at Informal Conference

AGREEMENT for a reduction in the domestic light rates at Springfield, Ohio, was reached at a conference on May 12 between members of the City Commission and representatives of the Springfield Light, Heat & Power Company, and has been ratified by the board of directors of the power company. Under this agreement the present rates of 11 cents for the first 15 kw.-hr. and 7 cents for all additional energy consumed will be reduced to 9 cents for the first 15 kw.-hr., 6 cents for the next 45 kw.-hr. and 3 cents for all additional energy. The agreement, which was reached in an impromptu conference on the sidewalk after the regular negotiations conducted at the meeting of the commission had apparently failed, is to run for a period of five years.

C. I. Weaver, general manager of the company, told the commission following the reaching of the agreement that under it the company's revenue would be reduced approximately $45,000 annually. He declared that the company would operate at a loss the first year, but hoped to make up for this through the five-year average.

Los Angeles-Southern California Edison Contract Consummated

FOR a consideration of $12,044,369.97 paid in cash, and on the execution of a contract by which the city agrees to purchase at wholesale all of the electric power which is not generated from its aqueduct, Los Angeles took over by purchase on Tuesday, May 16, the distributing properties of the Southern California Edison Company which lie within its boundaries. A resolution was adopted by the City Council stipulating "that the city will not support or lend its encouragement to any movement or measure which seeks to supplant the company by some other agency as the source from which it is purchasing its requirements for wholesale power over and above its own production," and that the city will not enter into competition with the company's electrical business in territory outside of its corporate limits.

The power purchase contract is for thirty years, but contains a provision that it may be canceled at the expiration of ten years, but only by a vote of the people. All operating and clerical employees of the company in Los Angeles went over to the city temporarily or permanently with the transfer, and the exchange of ownership was effected without an interruption of service or accounting.

Explaining the contract, W. B. Mathews, special counsel for the Los Angeles Public Service Department, said: "The contract provides that the Edison company has first right to purchase any surplus power generated by the municipal plants in addition to the amount needed to operate the city's system. It is indeed a fortunate circumstance that the Edison company is largely officered and controlled by men prominently identified with the business life of Los Angeles and deeply interested in the welfare of the city. This fact greatly facilitated the progress of negotiations resulting in the sale and transfer to the city of the Edison system. The city's growth makes it certain that it will be for many years a heavy purchaser of power from the company for distribution to the people of Los Angeles."

Speaking of the transaction, Vice-president and General Manager Ballard of the Edison company said: "With the taking over by the city of Los Angeles of the Southern California Edison Company's distributing properties located within the city there terminated in

mutual pledges of co-operation a most vexing economic problem. Calm judgment on the part of the city and company officials has resulted in the best possible arrangement that could be arrived at under the mandate of the people that the municipality itself distribute the valuable electric product of the aqueduct to consumers within the city. The $12,044,369.97 we received from the sale of our distributing properties will become part of the $22,500,000 appropriation which we have made for this year's development and transmission of power in the High Sierras."

Interconnection Advocated for Texas

THE great advantages that would accrue to electric light and power service in Texas through the interconnection of transmission lines upon somewhat the same general plan as has been outlined for New England in the report of the Superpower Survey to the national government were dwelt on in a recent interview given by C. E. Calder of Dallas, the retiring president of the Southwestern Electrical and Gas Association and the president of the Dallas Power & Light Company and the Texas Power & Light Company. Predicting that some day every city in the state will be connected with the others under the central control of one company or an association of companies, Mr. Calder continued:

"It is simply a matter of economy and efficiency in distribution. For instance, a city which has connections with out-of-town plants, as in Fort Worth during the recent flood, can connect with the outside lines over an emergency period and enjoy uninterrupted service. A connecting system of power plants also serves to distribute peak loads by utilizing the reserve power of connecting plants at the periods of greatest strain."

Mr. Calder pictured the future development of a Texas superpower system as a growth of plants on the river banks, convenient to communities needing and capable of using power and extending gradually into the eastern agricultural sections and more slowly into the prairie region of the west, but always becoming more and more closely connected.

French Place $8,000,000 in Electrification Contract

THE forward-looking policy of the French railroads in electrifying their main lines is evidenced by the recent definitive action of the Paris-Orleans Railway, one of the six great systems of France. According to dispatches recently received, this railroad, which operates over 5,000 miles of route, has placed an eight-million-dollar contract for eighty freight locomotives and eighty heavy high-speed passenger motor cars to operate on 1,500 volts direct current.

This equipment, according to a statement from the International General Electric Company, will be furnished by a group of French manufacturers headed by its French representatives, the Compagnie Française Thomson-Houston. While the larger part of the order will be manufactured in France, the statement reads, considerable material of American manufacture will, it is understood, also be required.

The engines will be used on an extension of the original electrification made a quarter of a century ago by the French Thomson-Houston Company with General Electric apparatus. The first part of the new 1,500-volt section will cover 125 miles of dense main-line traffic between Paris and Vierzon. The motor cars will replace and extend the present suburban steam service out of Paris.

The high-speed through-passenger service from Paris to Vierzon on the way to southern France will be served by 250,000-lb. electric locomotives capable of regular running speeds between 80 and 85 miles per hour. While these machines are not included in the contracts thus far awarded, the railway company is expected to announce the placing of this business at an early date and to give consideration soon to the purchase of large numbers of additional locomotives for use on the 2,000 miles of its system in the central plateau region.

Consolidation of Public Utilities at Columbus, Ga.

COMPREHENSIVE plans for the consolidation of electric, railway and gas utilities at Columbus, Ga., under the management of Stone & Webster, Inc., have been approved by stockholders of the Columbus Railroad Company, and if sanctioned by the Railroad Commission of Georgia will be put into effect in the near future. The Columbus Electric Company owns all the common stock of the Columbus Power Company, the Columbus Railroad Company and the Gas Light Company of Columbus. Recent legislation in Georgia has given to the railroad company, long engaged in the electric railway and retail electric light and power businesses, the right also to generate and furnish gas to consumers. It has long been apparent that it would be desirable to consolidate the subsidiary companies of the Columbus Electric Company in order that a flexible financial structure might be set up, adequate to care for the expected growth of business and such as to give the stockholders of the Columbus Electric Company direct ownership in the physical properties. The laws of the state confer the right to consolidate the power and railroad companies; the market is regarded as favorable for long-term or permanent financing, and the time is looked upon as advantageous for financing $1,750,000 of 6 per cent coupon notes of the electric company, due July 1, 1922.

The plan contemplates the changing of the name of the Columbus Railroad Company to the Columbus Electric & Power Company and provides for the issue by the new company of first mortgage bonds and 7 per cent cumulative first preferred stock to cover the indebtedness of the Columbus Electric Company, of 7 per cent cumulative second preferred stock to be exchanged for outstanding preferred stock of the Columbus Electric Company and the Columbus Power Company and of $1,500,000 new common stock to be distributed share for share for the present common stock of the Columbus Electric Company.

The initial capitalization of the Columbus Electric & Power Company will total $10,095,700, of which $5,167,000 will be in bonds and the balance in stock. A considerable amount of duplication of corporate administration will be eliminated by the consolidation. Gross earnings of the combined properties for the twelve months which were ended Jan. 31, 1922, were $1,824,787.

Officers of A. I. E. E. Formally Elected at Annual Business Meeting

AT THE annual business meeting of the American Institute of Electrical Engineers, held in New York on May 19, the report of the committee on tellers on the election of officials for the administrative year beginning Aug. 1, 1922, was presented, and the following were declared elected:

President—Frank B. Jewett, New York.

Vice-presidents—District No. 1, Giuseppe Faccioli, Pittsfield, Mass.; District No. 3, W. I. Slichter, New York; District No. 5, R. F. Schuchardt, Chicago; District No. 7, H. W. Eales, St. Louis (re-elected); District No. 9, H. T. Plumb, Salt Lake City.

Managers—H. M. Hobart, Schenectady; Ernest Lunn, Chicago, and G. L. Knight, Brooklyn, N. Y.

Treasurer—George A. Hamilton, Elizabeth, N. J. (re-elected).

The above, together with the following hold-over officers, will constitute the board of directors for the next administrative year: William McClellan, New York; A. W. Berresford, Milwaukee; N. W. Storer, Pittsburgh; C. G. Adsit, Atlanta; F. W. Springer, Minneapolis; Robert Sibley, San Francisco; F. R. Ewart, Toronto; L. E. Imlay, Niagara Falls; F. F. Fowle, Chicago; L. F. Morehouse, New York; Harold B. Smith, Worcester, Mass.; James F. Lincoln, Cleveland; E. B. Craft, New York; R. B. Williamson, Milwaukee; A. G. Pierce, Pittsburgh, and Harlan A. Pratt, New York.

The wide geographical distribution of the Institute's directors is indicated by the fact that twelve states and Canada are represented in the above list.

At the meeting of the board of directors held on the same date F. L. Hutchinson was re-elected secretary of the Institute for the coming administrative year.

New N. E. L. A. Section Chairmen

AT THE recent annual convention of the National Electric Light Association, held in Atlantic City, the following were elected to head the four sections for the coming year: R. F. Schuchardt, Technical Section; O. R. Hogue, Commercial Section; William Schmidt, Jr., Accounting Section; H. T. Sands, Public Relations Section. These new chairmen will succeed the following, who have headed these sections during the past year: N. A. Carle, Technical Section; R. H. Tillman, Commercial Section; E. J. Fowler, Accounting Section; M. J. Insull, Public Relations Section.

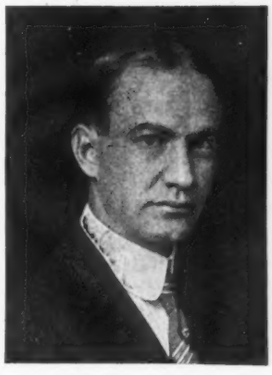
R. F. SCHUCHARDT
Electrical Engineer
Commonwealth Edison Company

O. R. HOGUE
Power Sales Department
Commonwealth Edison Company

WILLIAM SCHMIDT, Jr.
Secretary and Assistant Treasurer
Consolidated Gas, Electric Light & Power Co. of Baltimore

H. T. SANDS
Charles H. Tenney & Company

N. A. CARLE
Vice-President and General Manager
Public Service Production Co.



R. H. TILLMAN
New Business Manager
Consolidated Gas, Electric Light & Power Co. of Baltimore

E. J. FOWLER
Statistician
Commonwealth Edison Co.

MARTIN J. INSULL
Vice-President
Middle West Utilities Co.

Chairmen of N.E.L.A. sections for the coming year: Mr. Schuchardt, Technical Section; Mr. Hogue, Commercial Section; Mr. Schmidt, Accounting Section; Mr. Sands, Public Relations Section. Chairmen of N.E.L.A. Sections during past year: Mr. Carle, Technical Section; Mr. Tillman, Commercial Section; Mr. Fowler, Accounting Section; Mr. Insull, Public Relations Section.

Bond Issue of $12,500,000 Sold by Commonwealth Holding Company

THE Commonwealth Power, Railway & Light Company, New York, has sold $12,500,000 twenty-five-year 6 per cent secured sinking-fund gold bonds, the proceeds of which will be applied to the payment of banking indebtedness due Nov. 1, 1922, and convertible bonds due May 1, 1923. This provides for the greater part of the indebtedness of the company. The issue is offered at 90, yielding more than 6.80 per cent.

In arranging this financing it was found desirable to group into one company the ownership of all the controlled companies engaged in the electric light, power and gas business, and to this end the organization of a new company, known as Commonwealth Power Corporation, has been effected to acquire the common stock of the Consumers' Power Company, Central Illinois Light Company, Illinois Power Company, Southern Indiana Gas & Electric Company and Springfield Light, Heat & Power Company, together with $5,318,500 of the preferred stocks of some of these companies, all of which stocks have been pledged as collateral to the $12,500,000 twenty-five-year bonds to be sold. All of the preferred and the common stock of the Commonwealth Power Corporation come into the treasury of the Commonwealth Power, Railway & Light Company, either directly or through its subsidiary the Union Railway, Gas & Electric Company, so that the equity ownership of the Commonwealth Power, Railway & Light Company is not in any way adversely affected through the new issue of bonds.

Westinghouse Reports Sales for the Year of a Hundred Million

IN SPITE of the extremely adverse conditions of the past year, the sales of the Westinghouse Electric & Manufacturing Company amounted to almost exactly $100,000,000, as shown by its annual report, as of March 31, 1922. This is the largest volume of business ever handled by this company except during the abnormally active three years from 1919 to 1921. Manufacturing costs were high, however, and could not be reduced as rapidly as prices fell. Furthermore, the expense of development work and about $1,500,000 for depreciation of inventory were charged against manufacturing costs, so that the increase in surplus was only slightly greater than the amount paid out in dividends.

The excellent "cash position" of the company is shown by the fact that its current assets—including cash, United States securities, and accounts and notes receivable—total $41,700,000, while its current liabilities—accounts payable, dividends unpaid, accrued interest, etc.—are only $11,400,000. In addition, the company possesses an inventory of $55,000,000.

Chairman Guy E. Tripp states in his report: "The contraction in orders booked continued throughout the year until January, 1922, when there began a substantial improvement which has since been maintained. In addition to the favorable indications for an increasing demand for the regular lines of your company's products, a large demand for radio-telephone receiving apparatus has recently developed, with a prospect of its continuance for an indefinite period. It should be pointed out, however, that the ensuing year promises to be a period of keen competition."

The income account for the year is as follows: Gross earnings, $99,722,026.09; cost of sales, $93,461,846; net manufacturing profit, $6,260,180.09; other income, $2,673,808.65; gross income, $8,933,988.74; interest on bonds and notes, $3,096,600.08; net income available for dividends, etc., $5,837,388.66.

Hoover Calls Coal-Price Conference

TO MAKE effective a plan intended to prevent a runaway market in coal a general coal-price conference has been called by the Secretary of Commerce to be held in Washington on May 31. This announcement by Secretary Hoover followed a preliminary conference on May 18 at which fifty operators, representative of all the non-union fields, voted to use the Garfield schedule of prices of Oct. 29, 1917, as a basis for fixing fair prices of coal. At the same time announcement was made that buying for the larger consumers will be done through committees so as to unify these purchases and prevent the entrance of speculators.

Federal Court Sustains North Carolina Company Against Southern Power

THE suit of the North Carolina Public Service Company against the Southern Power Company has been decided in favor of the former company in the United States Circuit Court of Appeals at Richmond, Va., which has ruled that the defendant company cannot refuse to sell electrical energy to the plaintiff for resale and distribution to citizens of Greensboro and High Point, N. C. In this suit, which has been before the courts for nearly two years, the North Carolina company claimed that the Southern Power Company had discriminated against it by refusing to renew a contract on equitable terms, and the former company obtained a mandamus from the United States District Court forbidding discontinuance of service at Greensboro and High Point pending the determination of the case. It was alleged that no other supply of power than that of the Southern Power Company was available at the towns named.

The Circuit Court of Appeals in its finding for the plaintiff said:

"The right of eminent domain could not have been conferred on the defendant except in consideration of the service to the public expected of it in the exercise of the charter powers granted. This power of eminent domain cannot be separated from the duties assumed by the corporation. Exercising this right to carry its lines and power anywhere in the state by condemnation, the defendant has carried them to cities and towns and has there made contracts with other public service corporations under its charter power to use its property for 'transmission of current to independent vendors thereof.' Among these independent vendors furnished with current is the Southern Public Utilities Company. This company is nothing more than an offshoot of the Southern Power Company, controlled by it and with the same stockholders. It has made contracts with the Southern Public Utilities Company to furnish it current at a rate materially lower than that demanded of the North Carolina Public Service Company."

(For previous decisions rendered in this suit see ELECTRICAL WORLD for Dec. 25, 1920, page 1,282; July 9, 1921, page 88, and Jan. 21, 1922, page 152.)

Freight Rates Cut 10 per Cent

MOST unexpectedly the Interstate Commerce Commission on Wednesday handed down its decision on freight-rate revision, making a horizontal cut of 10 per cent effective July 1. From all early indications the cut is not being received favorably either by the railroads or the shippers. The 10 per cent reduction makes a considerable difference in the revenue of the railroads, but it is not sufficient to make any appreciable difference in the price of commodities. In coal, for instance, the most that any power company can expect will probably be not more than 50 cents per ton. On the average haul the reduction will probably be around 25 to 30 cents per ton.

In making its decision the commission refused to consider a lower valuation of the roads, but it did take the position that 5¾ per cent was a fair return. Prior to this time the roads had been permitted to earn up to 6 per cent.

Utah Light & Traction Offers $12,471,000 in Bonds to Yield 5.70

ANOTHER low-priced issue of electric light and power securities has come on the market this week, the Utah Light & Traction Company offering $12,471,000 in first and refunding mortgage 5 per cent gold bonds, series A, due Oct. 1, 1944, at 91 and accrued interest, yielding a little over 5.70 per cent. Of these bonds $12,136,000 were acquired in 1914 and 1915 in part payment for the properties by the Oregon Short Line Railroad Company (Union Pacific system) and have in the interim been in the treasury of that company. Their availability at the price quoted gives one more evidence of the growing ease of the money market where attractive public utility issues are concerned.

Senate Committee Not Likely to Favor Ford's Muscle Shoals Offer

TWO important developments took place in Washington during the week in connection with the investigations concerning the Muscle Shoals power and nitrate projects. The first was the appearance before the Senate committee on agriculture and forestry of Col. Hugh L. Cooper, the government's consulting engineer in the design and building of the Muscle Shoals power projects, with a new set of recommendations, which include the idea that the whole Muscle Shoals problem shall be referred to the Federal Power Commission, Congress meanwhile making an appropriation of $7,500,000 for another year's work to complete the dams.

The second important development was the presentation of informal proposals by the Alabama Power Company to proceed under the contract it has with the government for the purchase of the government's interest in the steam-power plant at Gorgas, Ala., on the Warrior River.

The Secretary of War reported to the Senate committee and to the House military affairs committee, which are considering the offers for Muscle Shoals of Henry Ford, the Alabama Power Company and others, that he has been offered $2,500,000 for the government interest in the Gorgas plant, the railroad and the transmission line to Sheffield, Ala. The sum mentioned being, for the single item of the Gorgas plant and appurtenances, half the $5,000,000 that Mr. Ford is offering for all of the government's $107,000,000 worth of property.

Survey of Simplification Needs to Be Conducted by Standards Committee

AT THE request of Secretary Hoover the American Engineering Standards Committee will undertake at once a canvass to determine what simplification in manufactured products is most needed. This canvass will be conducted through the engineering and technical bodies having representatives on the committee or co-operating in its work, and it will extend into almost every industry in America. It is a step in the movement fathered by Mr. Hoover to retrieve for industry a few of the billions of dollars wasted annually, and it indicates a co-ordination of this work and the work of the American Engineering Standards Committee.

What the relationship between the simplification work of the Department of Commerce and the standardization work of the Standards Committee should be has been the subject of considerable discussion. It is clear now that there will be no duplication or overlapping. The executive committee of the latter body has by resolution pledged co-operation. Representatives of the committee recently held a conference on the subject with Mr. Hoover, and subsequently an arrangement was made for permanent exchange of representatives between the two organizations.

Witnesses Heard For and Against the Bacharach Bill

ANOTHER hearing on the Bacharach bill was held before the House judiciary committee in Washington on May 23. This measure, which is designed to limit the power of federal courts in injunction proceedings, is not expected to become a law in the near future, but great interest is shown in the measure, and the hearings are well attended by many who believe the bill to be a dangerous and improper one. The hearing of May 23 was stopped by the demand for the presence of members of the House on the floor to answer to roll calls, and another hearing was set for June 8.

The chief witness at last Tuesday's hearing was Alfred P. Thom, general counsel of the National Association of Railway Managers, who appeared in opposition to the measure. He took the position that the proposed bill was obnoxious to the Constitution in that it would emasculate the equity powers of the federal courts, rendering them incapable of granting relief.

The only advocate of the bill to be heard was S. A. Ettleson, corporation counsel of Chicago. He related experiences of the city government with the traction company there and said the enactment of the Bacharach bill would save the citizens of Chicago $60,000 a day in street-car fares, a reduction in the fare being now prevented by federal court injunction.

The State Bar Association of Ohio was represented by F. E. Eagleson of Columbus, who contended that the bill if passed would deprive the federal courts of fundamental jurisdiction.

California to Increase Safety Standard of Pole Lines

THE California Railroad Commission has commenced an inspection of all pole lines in the state with a view to requiring elimination of hazardous conditions and the more complete enforcement of state law requirements relative to safety of employees and of the public. Utilities will be required to eliminate all hazardous conditions of line construction and comply fully with the requirements both under the state law and under the commission's rules on safety. For several years the commission has been preparing a new code of construction to improve safety conditions. Owing to the conditions which existed during the war and for a year or two thereafter detailed inspection work was postponed. Under the present plan all electric, railway, telephone and other utilities and municipalities operating pole lines will undergo a careful and thorough inspection.

Class D Members of the N. E. L. A. Meet at Atlantic City

A MEETING of Class D members of the National Electric Light Association was held during the Atlantic City convention last week. Routine reports of officers of the exhibition committee were presented. John Mustard of the Wagner Electric & Manufacturing Company, J. W. Perry of the Johns-Manville Company and F. D. Fagan of the Edison Storage Battery Company were re-elected to the exhibition committee for a term of three years. The reports showed that the exhibition this year included 25 per cent more exhibits than at any previous convention. It was also stated that the expenditures would come within the estimates originally prepared. A rising vote of thanks and appreciation was given to L. W. Shugg, director of exhibits. Several speakers commented on the able manner in which Mr. Shugg had handled his difficult duties.

The exhibition committee held its annual meeting on Wednesday, May 17. After transacting routine business officers were elected for the ensuing year as follows:

Chairman—C. L. Peirce, Jr., Hubbard & Company, Pittsburgh; secretary and treasurer, Frank H. Gale, General Electric Company, Schenectady.

Electric Rolling Mills Discussed by Steel Engineers

A POWER consumption of 88.5 kw.-hr. per ton of rolled product was one of the things dwelt upon in the description of the rotary-converter induction-motor system installed at the Calumet Steel plant, Chicago, given by F. R. Bert before the Association of Iron and Steel Electrical Engineers on May 15. Because of the fact that the plant had not been running continuously for some time complete economic data were unavailable. However, it was found that the total bills for energy had never equaled the old coal bills. From an operating viewpoint the shutdowns due to this new type of equipment were very small. Out of 2,700 hours of operation, a delay of only two-tenths of 1 per cent resulted.

According to Mr. Bert's figures, an increased tonnage of 10 per cent was obtained with this system. Its flexibility is shown at an input of 280 kw., where the time to attain full speed was only six seconds. The only trouble with the system was due to some wrong connection on the master control of the direct-current field which made the speed changes swing completely from low to high speed. This fault, however, was remedied and high flexibility returned.

The relation of the engineer to fuel conservation was presented very forcefully by J. W. Hayes of Chicago.

New York Commission Says Utilities May Not Recover Losses from Customers

"THE public does not insure a utility against loss. If poor business judgment has been exercised in the management of a property, the public should not suffer thereby. Neither should future ratepayers be called upon to reimburse the company for losses sustained by insufficient rates granted to past consumers of the company."

This ruling was made by the New York Public Service Commission on Monday in an order issued to the Western New York Utilities, Inc., of Medina directing that it return to the schedule of electric rates charged in Albion, Barker, Lyndonville, Medina and other places in Orleans, Niagara and Monroe Counties prior to Feb. 23, 1921, when the company increased its charges. Present rates are to be set aside on June 1, and the rates formerly charged are to prevail for a year and thereafter until changed by the commission. The general average reduction ordered is about 15 per cent. It was claimed by the company that it had never obtained an adequate return upon the value of its property used in the public service, and evidence was given by it that its rates for power in previous years had been too low.

Electric Steam Generator of 25,000-Kw. Rating Installed

THE Electric Furnace Construction Company of Philadelphia announces that an electric steam generator recently constructed and installed by the Dominion Engineering Works, Montreal, at the plant of the Laurentide Paper Company, in the Province of Quebec, and designed for 25,000 kw., is averaging 34,000 kw. and producing 100,000 lb. of steam per hour at 125 lb. pressure. This, the Philadelphia company says, is the largest electric steam boiler ever built, although the space occupied by it is small compared with that taken by the fuel-fired boilers it is replacing. The saving in coal alone, it is reported, amounts to 150 tons a day.

Danger from Amateur Radio Outfits

THE Cleveland Electric Illuminating Company is urging the City Council to enact an ordinance requiring the inspection of amateur radio plants in order to avoid the danger of their wires coming into contact with high-tension light, power and telephone wires. At a committee hearing, representatives of the company said that 489 aërials had been removed from its poles. Most of them were soon reattached in even more dangerous locations than before, in some instances joining to insulators carrying primary wires, in others crossing or paralleling high-tension wires at a distance of only a few inches.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

Sandusky Increases Output.—Station records of the Sandusky (Ohio) Gas & Electric Company for the month of April show that 985,000 kw.-hr. was generated. For the same month last year the output was 733,000 kw.-hr., an increase this year of nearly 35 per cent.

Transatlantic Radio Telephony.—A loud-speaking wireless-telephone installation has just been completed at Lausanne, France, which will be in communication with the Eiffel Tower telephone every evening and will be able to record communications from London, Berlin and even America.

Water-Power Development in Dutch East Indies.—A well-illustrated summary of the water-power situation in Netherlands East India, including Java, Sumatra, Celebes and Algemeen, has been issued in Dutch by the government of those countries, where extensive plans for electrification are in process of formulation.

Extension in Kentucky Mining Field.—It is reported from Whitesburg, Ky., that the Kentucky & West Virginia Power Company, which supplies about 90 per cent of the mine power used in the Hazard coal fields, has purchased the power and light plant of W. C. Daniel at Whitesburg and will bring in its high-tension wires, supplying that city and a number of coal mines in the vicinity.

Water Power on a Japanese Pacific Island.—No place nowadays is too remote or too small to escape the world-wide movement to exploit water power. Two little hydro-electric plants are to be established by the village of Mine, on the island of Hachijoshima, which is one of the seven islands of Izu on the outskirts of Japanese territory far on the Pacific. The project is to be financed by twenty-year bonds, the cost being estimated at 125,000 yen.

Daylight Saving Causes Confusion at Washington.—Daylight saving went into effect in Washington on May 15. The clocks were not put forward and as a result great confusion ensued. The government departments now open at 8 a.m. and close at 3:30 p.m. This arrangement supersedes the staggered-hour plan and increases materially the peak load which the street railways are called upon to handle. Congress, the theaters and many stores are retaining the same schedule of hours they have been following. Effort is being made to induce Congress to enact a daylight-saving law for the District of Columbia, but apparently no such action will be taken.

Employee Meetings in the Intermountain States.—The Rocky Mountain Electrical Co-operative League is sponsoring a series of employee meetings for the purpose of acquainting every employee in every branch of the electrical industry with the aims and purposes of the league and the work which it is doing and of thus extending the spirit of co-operation. At the first of these meetings, held in the main office of the Capital Electric Company, Salt Lake City, with almost 100 per cent attendance of that company's employees, the interest and enthusiasm shown are described as remarkable.

Daylight Saving in the Eastern States.—Three out of every four residents of New York State are now enjoying the benefits or suffering the penalties of daylight saving. Using the 1920 federal census statistics as a basis of computation, it is found that last year 75½ per cent of the people in the State had daylight saving, while this year, owing to opposition in the agricultural communities, the percentage has shrunk to 73. Two out of every three persons in New England and the States of New York, New Jersey, Pennsylvania, Delaware and Maryland are observing daylight-saving time. The total population of these states, based on 1920 census figures, is 31,334,717, of whom 20,727,116 live in cities, towns and villages where daylight saving is observed.

How Service Was Maintained in Flooded Illinois Town.—Beardstown, a city of 8,000 people on the Illinois River, was flooded during the recent period of high waters in the Middle West. How the Central Illinois Public Service Company, working under extreme difficulties, was able to give the city continuous gas and electric service is recounted by a local paper, which says as regards the work of the central station: "Maintenance of electrical service was a feat in itself. With a total of only fourteen minutes' intermission during the entire period of the flood, the company is believed to have established a noteworthy record. At the crest of the flood the water in some sections was so high as to be only a foot from the wires. The longest single intermission was approximately eight minutes. This was caused by a storm at Keokuk."

Radio Plants Soon to Link Continents.—High-power wireless stations of the Radio Corporation of America will be completed this year at Bogota Bay, Colombia, and in Cuba, and the great Buenos Aires station will be in operation by the middle of 1923, according to E. J. Nally, president of the company, who has returned from conferences in Europe at which a working agreement was reached among the chief wireless companies of England, France, Germany and America. From any part of the United States wireless messages may be relayed speedily to Buenos Aires, South Africa, Java, Calcutta or Melbourne, when the radio building programs of the great American and European countries are completed. At present France has the most powerful station in the world in the American-built Lafayette towers near Bordeaux, but this will be superseded by the end of this year by the Port Jefferson station of the Radio Corporation. The station under construction at Ste. Assise, near Paris, will be second. The British wireless chain connecting England with all parts of the empire will have one station comparatively close to Argentina; that will be the station at Bathhurst, in Gambia, on the extreme western point of Africa, where the continents of Africa and South America make their closest approach. The plans of France for extremely long-distance communication are centered in the station at Ste. Assise. This station is expected by its promoters to communicate with Saigon, Indo-China, 5,500 nautical miles; Buenos Aires, 5,950 miles, and, of course, many nearer points. Holland is building one station at home and one in Java for communicating a distance of 6,100 miles, almost entirely overland.

Associations and Societies

Geographic Division Conventions of N. E. L. A.—Now that the Atlantic City convention is past, interest centers on the annual meetings of the geographic sections of the National Electric Light Association, which, as announced below, include those of the Pacific Coast Section, at Los Angeles, assembling next Wednesday; of the Northwestern, the North Central and the Canadian sections, meeting in June at Boise, St. Paul and Ottawa respectively, and of the New England Section, which is to meet at New London, Conn., in the first week of September.

Coming Meetings of Electrical and Other Technical Societies

N. E. L. A. Geographic Divisions—Pacific Coast, Los Angeles, May 31-June 3; Northwestern, Boise, June 7-10; North Central, St. Paul, June 13-15; Iowa Section, Lake Okoboji, June 20-22; New England, New London, Conn., Sept. 5-7.

American Association of Engineers—Salt Lake City, June 5-7.

American Society Heating and Ventilating Engineers—Buffalo and Detroit, June 6-10.

Electric Power Club—Hot Springs, Va., June 5-7.

Canadian Electrical Association—Ottawa, Ont., June 15-17.

Associated Manufacturers of Electrical Supplies—Spring Lake Beach, N. J., June 19-25.

Society for the Promotion of Engineering Education—Urbana, Ill., June 20-23.

American Society of Civil Engineers—Portsmouth, N. H., June 21-22.

American Association for the Advancement of Science—Salt Lake City, June 22-24.

American Physical Society, Pacific Coast Section—Salt Lake City, June 22-24.

Association of Municipal Electrical Utilities of Ontario—Niagara Falls, Ont., June 22-24.

A. I. E. E. Annual Convention—Niagara Falls, Ontario, June 26-30. (For program see issue of May 13, page 968.)

American Society for Testing Materials—Atlantic City, N. J., June 26-July 1.

National Council Lighting Fixture Manufacturers—Cleveland, June 28-29.

Ohio Electric Light Association—Cedar Point, Ohio, July 11-14. (For program see issue of May 13, page 972.)

A. I. E. E., Pacific Coast Convention—Vancouver, B. C.—Aug. 8-11.

International Association of Municipal Electricians—New Bedford, Mass. Aug. 22-25.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Betterments and New-Business Expenditure in Relation to Rates.—Where the physical value of a company's properties has been fixed, the Supreme Court of Washington has held in State ex rel. City of Spokane and State ex rel. Spokane Falls Gaslight Company vs. Director of Public Works, the Department of Public Works must at each subsequent hearing upon rate controversies ascertain the betterments since the date of the preceding hearing and the cost of reproducing such betterments and supplement the former finding with the additions. The reasonableness of an expenditure incurred in obtaining new business also falls, in the opinion of the court, within the regulatory power of the department. (205 Pac. 3.)*

Supreme Court Gives Final Blow to New York State 80-Cent Gas Law.—The Supreme Court of the United States has handed down a unanimous decision virtually disposing of the remaining litigation involving the question of the price of gas in New York. In line with its decision in the Consolidated Gas Company case, it held the 80-cent gas rates as fixed by the law of 1906 to have been confiscatory for the entire period of 1919 to 1920. Seven subsidiaries of the Consolidated Gas Company were affected, and approximately $10,000,000 which had been impounded pending the outcome of the rate cases is freed. It was said that the gas cases were perhaps the bulkiest and most expensive ever presented to the Supreme Court. The court cut the compensation of the special master from $118,000 to $49,250.

Powers of California Railroad Commission.—Finding, in Water Users and Taxpayers' Association of Merced vs. Railroad Commission, that the commission's regulatory powers do not include corporate governmental agencies such as municipal corporations or irrigation districts, even when engaged in the exercise of proprietary functions, the Supreme Court of California none the less decreed that the commission had the power to approve a contract between the San Joaquin Light & Power Corporation and the Merced Irrigation District for the purchase from the latter by the light and power company of hydro-electric energy, as against the objection that the commission had no power, in determining the basis of the price to be paid for such hydro-electric energy, to take into account properties and plant of the irrigation district which were not in existence at the time of such determination, when the cost of their construction and their output of hydro-electric energy could not be known. (205 Pac. 682.)

Contract Made by Power Company to Furnish Energy to City Plant May Be Upset by Commission.—The city of Cimarron, Kan., having found its municipal plant inadequate and contracted to purchase electrical energy from the Midland Water, Light & Ice Company, subsequently brought suit against that company to enforce the terms of its fifteen-year contract and claimed that the Public Utilities Commission, which had granted increased rates, was without jurisdiction. The Kansas Supreme Court has overruled the city's contention and found that under a statute passed before the making of the contract the commission possessed the power which it had exercised. (205 Pac. 603.)

Contracts Between Public Service Corporations Which Involve Obligations to Public Are Subject to Commission's Control.—In a suit brought by the Oklahoma Gas & Electric Company and three other utilities engaged in the distribution of gas against the Oklahoma Natural Gas Company, a producing concern, a writ of prohibition was sought to enjoin the Corporation Commission of the state from proceeding to inquire into contracts entered into between the plaintiffs and the defendant. The Supreme Court of Oklahoma found that a writ of injunction could not be issued when the contracts concerned might be unconscionable, oppressive or impair the obligations of the utilities to the public. The question was not, the court said, whether the petition of the Natural Gas Company to the commission did or did not allege facts entitling it to relief from the contract, but whether under any circumstances the commission had jurisdiction. (205 Pac. 768.)

Municipality Cannot Increase Contract Rates Deemed Inadequate—The Supreme Court of Iowa, in Town of Sibley vs. Ocheyedan Electric Company, an action to recover a sum claimed for electrical energy furnished to the defendant by the plaintiff city, affirmed judgment for the defendant, asserting that under the statutes of the state the municipality has no power to increase contract rates entered into in 1914 for twenty years, on the plea that they were no longer adequate, unless the consent of the other party to the contract is obtained. Where a municipality is authorized to make a contract for the sale of the product of its electric light plant to those outside its corporate limits, the court held, the terms and declarations of such contract rest within the sound discretion of the municipal authorities, and when it has been fairly entered into it can only be overthrown by the courts for fraud, abuse or excess of authority, or other like grounds (187 N. W. 560.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Money Expended from Earnings for Additions and Betterments Excluded from Valuation.—The city of Cushing, Okla., asked for a reduction in electric rates, and at the same time the Minnesota Electric Light & Power Company filed an application for an increase. In valuation proceedings the Corporation Commission of Oklahoma refused to include property valued at $12,515 not used in the public service and also expressed its belief that, although $27,500 was charged to depreciation reserve, all expenditures for replacements or renewals have been made from earnings and charged to operation. The commission also found that only $56,000 of new capital had been invested, while during the same period $91,481.97 had been expended for additions and betterments, leaving $35,481.97 which had been taken from the earnings of the plant and so invested. The commission takes the position that this represents an investment not by the company but by the public and cannot be included in the valuation for rate-making purposes. Nor will the commission permit expenses incurred in making fights for increased rates to be added to operating expenses.

Fair Return During Business Depression.—In settling rates for the Indiana Bell Telephone Company the Indiana Public Service Commission recently made these comments on the right of a public utility to a fair return upon its property during a period of business depression: "It is contended that because other business is slack and suffering loss public utilities should likewise be forced to forego all earnings on their investments, and in this particular case it is strenuously contended that this utility should be required to continue to operate at an actual daily loss. All these curious arguments overlook the important fact that the public utility business is radically different from any other. Public utility business is regulated, and other business is not. . . . There is another important difference between the public utility business and private unregulated business. In time of adversity, or in hard times like the present, the private business ceases to borrow money, immediately cuts down expenses by discharging men, by cutting wages, by refusing to buy unless the price is satisfactory, and, if necessary, it reduces its output or closes up shop and waits for more prosperous times. The public utility can do none of these things. It must continue to operate at full blast, regardless of the nature of the times."

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

Charles Foster has opened a consulting office in mechanical and electrical engineering in the Sellwood Building, Duluth, Minn. Mr. Foster has had thirty years' experience in the design, construction and operation of public utility plants. He was born in Dwight, Ill., in 1874 and received his technical training at the Iowa State College. He started his engineering experience as shift engineer at the Ames (Iowa) municipal lighting plant, after which he operated several plants in the Northwest Central States, including those at Algona and Sheldon, Iowa, and

CHARLES FOSTER

Bismarck, N. D. Later he designed and constructed electric light and power heating plants for the State Capitol at Bismarck and spent nine years as designing and construction engineer for a contracting firm doing business in the territory adjacent to St. Paul. He was later associated with Charles L. Pillsbury, consulting engineer, St. Paul, and designed and supervised the construction of the new electric light and power plant at Hibbing, Minn. Mr. Foster's engineering practice and experience cover virtually all branches of electrical and mechanical engineering.

Fred W. Insull, president of the Public Service Commission of Oklahoma, has been appointed chairman of the railroad committee and a member of the oil and gas committee of the Tulsa Chamber of Commerce.

W. E. Brown has been transferred from the Northern Texas Electric Company to the Houston Electric Company, where he will act as superintendent of power. Mr. Brown was secretary to the manager of this company for two years previous to his transfer.

Milton H. Locke, for many years connected with the sales department of the Connecticut Power Company, has resigned to become commercial manager of the Salem (Mass.) Gas Light Company.

C. W. Hunter, gas engineer with Stone & Webster, Inc., has resigned to become vice-president in general charge of the business of the Davis & Farnum Manufacturing Company, Waltham, Mass.

W. F. Raber, vice-president and general manager of the Arkansas Valley Railway, Light & Power Company, is serving as a representative of the city of Pueblo on the Colorado Tax Revision Committee of One Hundred.

A. J. Muth of Chicago has been elected by the Board of Public Works at Goshen, Ind., as superintendent of the municipal light, water and heat plant to fill the vacancy caused by the resignation of Joseph H. Stewart of Goshen, which becomes effective June 1.

Dr. Carl Hering of Philadelphia was made an honorary member of the American Electrochemical Society at its recent meeting in Bethlehem, Pa. Dr. Hering is one of the founders of the society and an ardently interested worker in its affairs. He has made extensive studies of electric furnaces.

William F. Strouse, chief engineer of the Public Service Commission of Maryland, has resigned, effective July 1, and will be succeeded by H. Carl Wolf, now engineer of utilities for the commission. Mr. Strouse will continue as a member of the commission engineering staff in the capacity of valuations engineer.

H. D. Miller, who has been connected with the Western States Gas & Electric Company, Stockton, Cal., since 1919, has recently been promoted to the position of commercial agent. Prior to entering the army in 1917 Mr. Miller was in the service of the Westinghouse Electric & Manufacturing Company at East Pittsburgh.

Carl G. Schluederberg has been elected president of the American Electrochemical Society, his election having taken place while he was en route to the United States from South America, where he made a survey of business conditions for the Westinghouse Electric & Manufacturing Company. Mr. Schluederberg, who is executive assistant to the manager of the Westinghouse Electric Company, has been extremely active in American electrochemical circles and is a member of the Pittsburgh Section, A. E. S. He has been a member of the board of directors for the past six years.

E. E. Hunter, chief engineer of the Oklahoma Gas & Electric Company, has been elected vice-chairman of the Oklahoma Section of the American Institute of Electrical Engineers.

Vreeland Y. Leonard of Indianapolis has taken over the management of the utilities department of the Interstate Public Service Company, Columbus, Ind. He succeeds Kenneth Swan, who has been transferred to the engineering department of the company. Mr. Leonard, who will have charge of the local electric lighting plant, was formerly a consulting engineer.

Harry Reid, who was recently elected president of the Great Lakes Division of the N. E. L. A., is the head of the Interstate Public Service Company, Indianapolis, Ind. Mr. Reid was born in Johnstown, N. Y., on Dec. 31, 1879, and at the age of twenty-one years obtained a position as cashier with the Fulton Gas & Electric Company of Johnstown and Gloversville, N. Y. He served this company in almost every

HARRY REID

capacity except that of manager until 1907, when he became owner of the Versailles (Ky.) Electric Light Company. He disposed of this property in 1912 to the Middle West Utilities Company and became its first vice-president. In 1913 Mr. Reid was elected president of the Kentucky Utilities Company, a position he still holds. In 1917 he was elected to the presidency of the Interstate Public Service Company.

Oscar Clifford has been appointed commercial agent of the Reno (Nev.) properties of the Stone & Webster Company, succeeding W. H. McInnis, who was transferred to a similar position with the Keokuk Electric Company.

W. E. Murchie, superintendent of the municipal light and water plants at Muncie, Ind., has resigned. He was succeeded by Clarence Griffith, who was formerly connected with the light plant. Mr. Murchie will go to Goshen to be manager of the Goshen and Warsaw light plants, which were recently bought by the Middle West Utilities Company.

R. H. McLain, until recently in the power and mining engineering departments of the General Electric Company at Schenectady, has resigned to become sales manager of the Maine Electric

R. H. McLAIN

Company, manufacturer of dynamos and motors, Portland, Me. Mr. McLain is well known in the material-handling field, having specialized on the handling of materials with electrical machines while with the General Electric Company. He was born in 1886 and was graduated from the University of North Carolina in 1906, going soon thereafter into the employ of the General Electric Company in the testing department, where he remained for two years. Later he was transferred to the industrial-control engineering department and finally to the power and mining engineering departments of the company. While in this work he had an active part in the electrical engineering of many coal and ore-handling docks on the Great Lakes, along the Atlantic seaboard and on the Panama Canal, his experience including the electrification of cranes and hoists of all sizes and kinds. Mr. McLain has been interested in technical society work, being an associate member of the A. I. E. E. and connected with the committee on cranes and hoists of that society, an associate member of the Association of Iron and Steel Electrical Engineers, a member of the American Institute of Mining Engineers and of the Society of Terminal Engineers. He has served as chairman of the equipment committee of the material-handling division of the A. I. M. E. and was president of the Society of Terminal Engineers for the year 1921-22. He has prepared a number of short articles and papers dealing with material handling for these societies and for various publications.

B. A. Plimpton has been appointed sales manager of the Locke Insulator Corporation, Le Roy, N. Y.

George W. Sanford has been made general manager of the Bristol Brass Corporation, manufacturer of brass, Bristol, Conn.

Travis Welch has been appointed Western representative for the Beverly Lights Corporation, Providence, R. I., with headquarters in San Francisco.

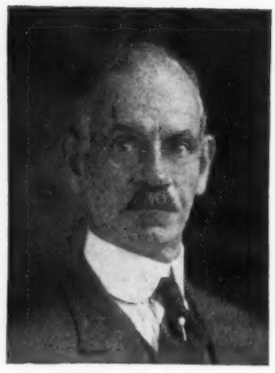
O. E. Crites, sales manager for the Sheridan County (Wyo.) Electric Company, has resigned to take over one of the Colorado districts for the Hoover Vacuum Cleaner Company.

Clarence W. Kinney, formerly electrical engineer, Royal Worcester Corset Company, Worcester, Mass., has joined the organization of the Economy Electric Company in the same city.

E. F. Du Rieu of the General Electric Company has left for Australia, where he will be connected with the Australian General Electric Company, Melbourne.

J. P. Hutcheson has returned to the Electrical Engineering & Manufacturing Company, Pittsburgh, after an absence of two years, as manager of the Cleveland office of the company. Mr. Hutcheson was on the sales force of the Westinghouse Electric & Manufacturing Company for a number of years, resigning to go with the Electrical Engineering & Manufacturing Company in 1919. In 1921 he left to become district representative in Chicago for the Latrobe Tool Company.

K. A. Pauly, head of the steel-mill section of the power and mining department of the General Electric Company, has recently been appointed chief engineer of the power and mining department of that company, succeeding D. B. Rushmore, who has been appointed to the consulting engineering department. Mr. Pauly was born in Springfield, Mass., in 1872 and entered the Massachusetts Institute of Technology, being graduated in 1896. He was employed by the American Telephone & Telegraph Company from his graduation until 1899, when he entered the General Electric Company's test depart-



K. A. PAULY

ment. He left the test department in 1901 and was in the induction-motor designing department until 1905, when he entered the power and mining engineering department.

J. S. Tritle has been appointed manager of the merchandising sales department of the Westinghouse Electric & Manufacturing Company. Mr. Tritle was engaged in the electrical engineer-

J. S. TRITLE

ing and contracting business in St. Louis from 1894 to 1902, when he was appointed chief superintendent of construction at the St. Louis world fair. He held this position until 1905, when he was appointed district manager of the Kansas City office of the Westinghouse Electric & Manufacturing Company. Later, when the Kansas City and St. Louis offices were combined, with headquarters at St. Louis, he was made district manager of the St. Louis office, which position he has held ever since.

Obituary

Francis F. Squire, vice-president and general manager Fiberloid Company, Springfield, Mass., and previous to that secretary and treasurer of the Connecticut Valley Metal Trades Association, died at his home in Springfield on May 8, at the age of forty-six.

Francis G. Wood died recently at his home in Utica, N. Y. Mr. Wood was a pioneer in telephone-line construction and operation in that section and for years was identified with the Central New York Telephone & Telegraph Company and later in an executive capacity with the New York Telephone Company.

Richard H. McGrath died at his home in South Braintree, Mass., on April 18 after a long illness. He had been in the employ of Stone & Webster for about eighteen years, during which time he had been connected with the Chase-Shawmut Company, the Minneapolis General Electric Company, the Fort Hill Chemical Company, the General Electrochemical Company, the Cell Drier Machine Company, the American Valley Lumber Company and the Chicago, Wilmington & Franklin Coal Company.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

General Conditions Proving Basis for Confidence

WITHIN the past two months there has been an unmistakable improvement in general business conditions all over the country, and a consideration of the general situation is giving confidence to many manufacturers whose business still has to feel largely increased demand. Foremost among the industries showing great improvement is the steel industry. Records of output and unfilled tonnage of both the United States Steel Corporation and the independents are distinctly favorable, while the construction trades and allied industries for some time past have sent in record-breaking reports, with iron and steel leading. Closely connected with this is the gain in general transportation disclosed by the weekly figures on car loadings, figures which have grown each week recently.

There have been reports of scarcity of supplies in various lines, building materials being prominent in this regard, and as a result prices have shown a firm upward tendency. Retail trade has improved slightly, though still below normal, and the prospect of better crops makes it almost certain that the end of the summer will witness a further betterment. Copper mining and lumbering in the West and Northwest are again on their feet. Coal mining and the textile industry are seriously disturbed by labor troubles, but the agitation has not extended to other fields. Foreign exchange is better and may help exports to regain some lost ground, and the stock market is showing activity.

New Motor Business Dominated by Sales Engineer

SLOWLY but surely the curve of motor sales is rising out of the trough which expresses the effect of the recent extreme depression of general business upon the movement of this class of apparatus. Although small-order sales dominate the market, their persistence and tendency to multiply offers much encouragement to the manufacturer and distributer of first-class products.

This branch of the industry suffers by contrast with wartime demands. Misapplications of motors from the standpoint of efficiency and power factor were forced by the pressure to equip old tools for direct and group driving, and the rush to install anything that would do the immediate work in hand left American manufacturers with an enormous overcapacity in motors on their hands. Within the last year or two many industrial concerns have revamped their motor layouts, and this has led to the redistribution of some machines and to the purchase of new ones in considerable scattered quantities. There is no question, however, that the fitness of many motor installations for present and future economical service would be difficult to demonstrate, and now that general business is picking up in so many sections, capable motor sales engineers are advocating investigations of motor loading, power-factor conditions (especially in relation to bills for energy purchased) and reapplication of motors for more accurate service.

Sales of motors are subject at present to extremely acute competition and are accompanied by more "proposition" work and technical analysis than has been the case for a long time. On this account certain new designs of motors have made better headway in the market than might have been expected, and the competition between makers of advanced designs and some of the older builders of motors is exceptionally sharp for the moderate volume of business offered. Deliveries are in comfortable shape, and not much is heard at present about price movements. Well-informed opinion is to the effect that the opportunities for business in motors depend at present very largely upon the skill with which the motor designer, manufacturer and sales staff succeed in convincing the buyer that particular types and ratings of motors will render the most economical over-all service in competition with other lines.

Collection Conditions Vary, but General Trend Is One of Improvement

COLLECTIONS in various sections of the country in the last month have varied a great deal, mainly on account of local conditions, but increasing business is being noted and with that comes encouragement in the credit field. It is found that delinquents in the contractor-dealer industry are becoming fewer as the building boom continues, for many of the buildings started in the early spring are ready for electrical work and contractors are moving their stocks much more rapidly than two months ago. Jobbers, too, are experiencing a greater demand, and more firms in this class are discounting their bills with manufacturers than formerly. Credit departments are feeling the effects of a long, dull winter, however, and estimates place the average length of collections still at around sixty to sixty-five days.

In the East jobbers and contractor-dealers are doing better as a rule in cleaning up their past-due bills, while the smaller dealers handling appliances and electrical equipment at retail are somewhat slow. This is due to the mood of the public, which is still buying conservatively. However, there has been no increase in the last thirty days in the number of delinquent accounts reported to credit associations, while, on the other hand, the number of reported accounts settled has been larger. An average of from sixty to seventy days is being maintained.

Although marked differences of opinion as to collections are reported by leading New England jobbers, the prevailing view is that the last thirty days proved much poorer than the previous period in the credit man's department, and that immediate prospects indicate hard work in rounding up delinquents. One jobber who has always selected credit risks with great care reports about sixty days on collections, but others of high caliber find it difficult to settle their accounts on less than ninety days just now. A good deal of trouble has been experienced in putting trade acceptances through. Contractor-dealers are to some extent affected by labor troubles in the textile fields and leather sections. Apart from labor troubles, however, the underlying business situation shows a good deal of strength, and the tendency for business to increase in electrical circles is looked upon as encouraging.

Collections throughout the Middle West have not changed materially excepting where the transactions are radio equipment. Well-established jobbers and retailers are not worrying credit men so much as the small country dealers who depend upon the customer's final settlement in order to pay their own bills. This condition has existed all winter, but patience is shown and a time extension given to each worthy dealer. Where the collections are for radio, a better response has been noticed, which jobbers say is a result of

low stocks and quick turnover. By paying up the old bills dealers feel that their chances for obtaining quicker shipments will be improved. On an average good accounts will run about sixty days.

Reports relative to collections in the St. Louis territory show, on the whole, rather satisfactory conditions. This is an important season in this regard for boot and shoe and wholesale dry-goods establishments in this district, and both of these interests report results better than a year ago. Payments on current business are generally excellent. As has been the case for a year or more, old accounts are being paid more slowly, though old indebtedness has been considerably reduced. The average time for collections remains at about sixty days. Money is readily obtainable from the banks, and interest rates are lower, ranging from 6 to 7 per cent.

General reports seem to indicate an improvement in collections in the Southeast, there being some tendency on the part of debtors to liquidate accounts that are quite old. It is still necessary, however, to bring a great deal of pressure to bear to get collections in promptly, and all jobbers are using extreme care in the extension of new or additional lines of credit to any but the most reliable purchasers. Acceptances rediscounted and purchased in the open market in this district for March were double those of February and exceeded those of March, 1921, by 500 per cent. Commercial failures show a slight decrease in number but an increase in total liabilities.

On the Pacific Coast collections are still rather slow, but within the next month or so the vigorous measures taken to restrict the duration of cash sales are expected to bring a decided improvement. Time sales of electrical appliances are reported to be in much greater proportion to total sales than was the case a year ago. Many dealers who have not catered to this class of trade to any extent before are finding that more and more of their former cash customers are seeking to buy on time now.

Trade Commission Attacks Douglas Fir Company, Alleging Trade Restraint

FORMAL complaint has been issued by the Federal Trade Commission against the Douglas Fir Exploitation & Export Company and 107 stockholders and officers in the respondent association who are lumber manufacturers in the States of Oregon, California and Washington. The complaint charges conspiracy to hinder and obstruct competition and alleges that the respondent association is not engaged solely in export trade and therefore does not come within the jurisdiction of the Webb-Pomerence act.

The Trade Commission in announcing the complaint says: "It is alleged that the association controls the manufacture and sale of 85 per cent of all the Oregon pine, red fir and yellow fir which is manufactured in the United States. It is further alleged that in order to carry out the conspiracy the respondents coerced competing manufacturers to join their association and to abide by their plan of equalization of distribution of orders, attempted to injure foreign competitors by price cutting, refused to sell lumber to export merchants who would not make 85 per cent of their purchases from the association or who bought any lumber elsewhere below the association prices, and followed other coercive and unfair methods of business."

April Electrical Imports Less Even than Preceding Month

IMPORTS of electrical goods into the United States through the port of New York in April amounted to only $23,784. This figure, supplied unofficially by the Bureau of Foreign and Domestic Commerce, Department of Commerce, is less by almost $3,000 than the negligible total of electrical goods brought into this country the preceding month.

As in the previous month, the largest source of electrical imports was Germany, though her total was not large enough to cause much worry to American electrical manufacturers. England, France, Norway, Italy and Czechoslovakia also appear on the list of exporting countries.

The value of each article together with the country of origin was as follows: Carbons, Germany $2,050; England $10; cable instruments, England $150; dynamo brushes, England $1,385; France $200; hair driers, Germany $2,105; heating and cooking utensils, Germany $2,901; lighting fixtures, Czechoslovakia $6,800, Germany $925, England $700, Italy $55; table lamps, Germany $1,588; wireless apparatus, France $515, England $760, Germany $125; hair straighteners, Germany $466; flatirons, Germany $946; batteries, Germany $31, England $41; controllers and switchboards, England $225; fans, Italy $350; hat pressers, France $300; bicycle headlamps, England $35; massage and toilet apparatus, Germany $966; phonograph parts (electric), France $12; push-buttons, Germany $110; resistances, England $23, Norway $10.

Metal Market Situation

THE upward trend in copper continued all last week, and by Monday of this week the generally established price for electrolytic copper, immediate delivery, was 13⅝ cents per pound with some offered at 13¼ cents. Predictions were freely made that the price would not endure long because of the large demand from consumers in this country who are continuing their purchases regardless of the higher prices, apparently being convinced that the advance will continue.

The sustained demand from domestic sources has been the most significant factor in the market. In the past year or so whenever price advances were made the users in this country invariably withdrew from the market, and within a few weeks prices would recede once more. However, in the past conditions were radically different and really did not justify the attempts to advance quotations. Now the statistical position of the metal is as satisfactory as producers could want, and consumers evidently realize the advisability of covering for their requirements. Consequently, far from there being a let-up in demand after each advance, there has actually been a more urgent call. At the end of last week consumers were actually crowding each other in an effort to place their orders.

Conditions among copper users have improved very much in the past two months, and it is believed that future orders, which in April were considered to cover requirements rather well for the second quarter and part of the third quarter, are proving inadequate. Manufacturers of wire have found their bookings increasing, as have various other manufacturers of electrical equipment, while the automobile industry is running full blast and is taking all the copper and brass that manufacturers can produce for it.

In addition to the good domestic business the export demand has been growing daily. Higher quotations on foreign orders have not caused any drop in buying.

NEW YORK METAL MARKET PRICES

Copper:	May 16, 1922	May 23, 1922
London, standard spot	£ s. d. 60 10 0	£ s. d. 62 2 6
	Cents per Pound	Cents per Pound
Prime Lake	13.25	13.87½
Electrolytic	13.00 –13.12½	13.75
Casting	12.62½	13.12½
Wire base	14.62½–14.87½	15.12½–15.37½
Lead, Am. S. & R. price	5.35	5.50
Antimony	5.37½–5.50	5.37½– 5.50
Nickel, ingot	36.00	36.00
Sheet zinc, f.o.b. smelter	7.50	7.50
Zinc, spot	5.50	5.50
Tin, straits	30.75	30.87½
Aluminum, 98 to 99 per cent	19.10	19.10
OLD METALS		
Heavy copper and wire	11.25 –11.37½	11.50 –11.75
Brass, heavy	5.25 – 5.50	5.25 – 5.75
Brass, light	4.87½– 5.12½	4.87½– 5.25
Lead, heavy	4.50 – 4.62½	4.70 – 4.80
Zinc, old scrap	2.75 – 3.00	2.75 – 3.00

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

A DEMAND well maintained and fairly well distributed throughout the various electrical lines marked last week's market, and it differed little in that respect from the weeks immediately preceding it. The electrical industry as a unit, it must be admitted, is not enjoying as rapid a rise as some others, steel and lumber, for instance; but every inch it has regained during the last six months has been recaptured for good and, however slow the return to prosperity is, there is no doubt that the electrical trade is well started on it.

Boston and St. Louis are the first of the larger centers to report any considerable stiffening of wire prices, but happenings in the copper market take all the elements of surprise out of the advance. In Boston and the surrounding territory electric ranges and refrigerating units are in surprisingly good demand. There have been moderate increases on lock nuts, bushings and conduit boxes in Chicago. Good business is looked forward to in the Southeast within the next ninety days, there being $25,000,000 to $35,000,000 worth of fruit and melons to be shipped from there in that period. There have been very large orders for railroad equipment placed in St. Louis in the last few days, and industrial electrical equipment also is picking up there.

NEW YORK

Business in the electrical trade appeared to move along on an even keel during the past week, and the demand for wiring supplies has been well sustained. No unusual conditions have arisen and no important price changes have been announced. Some price competition is still in evidence, but the trade in general is more brisk and does not wait so much upon prices.

Building activity continues unabated, and a considerable quantity of wiring supplies has been ordered for future delivery. In addition to this, jobbers report an increasing number of inquiries, indicating further prospects of future business.

Of the appliances, fans, flatirons, toasters and vacuum cleaners are moving fairly well, but the rest of the line is very sluggish. Radio equipment is still much in demand, but the public appears more inclined to buy parts rather than complete sets. Dealers, however, are anxious to obtain stocks of complete outfits, and orders are booked far ahead of deliveries.

Conduit.—Pipe is moving satisfactorily, but there is a rather wide range in quotations. Some jobbers have not as yet advanced their prices in accordance with the latest schedule. Good-sized stocks in jobbers' hands have enabled them to hold to the former quotations. Prices on rigid conduit showed the following range this week. For ½-in. black pipe in 2,500-ft. lots, $44.50 to $46.58; ¾-in., $58.10 to $59.57, and 1-in., $82.79 to $84.66 per 1,000 ft. Quotations on galvanized pipe in the same sizes and quantities were $50 to $51.68, $64.50 to $66.47 and $92.20 to $94.88 per 1,000 ft.

Rubber-Covered Wire.—Demand is rather spotty, and prices this week have softened somewhat. Quotations on No. 14, rubber-covered, single-braid, are from $6 to $6.15 per 1,000 ft. In quantities of more than 5,000 ft., prices range from $5.90 to $6 per 1,000 ft. Stocks are fair to good.

Flexible Armored Conductor.—The movement of this material continues to be satisfactory and stocks generally are in good shape. No. 14, two-wire, single-strip, is quoted at $43 to $45 per 1,000 ft., and double-strip at $45 to $47 per 1,000 ft.

Loom.—There is only a fair demand for this material. The 3/32-in. and ⅛-in. sizes, listing at $5.50 and $6 per 100 ft., are quoted at 70 per cent off list in coil lots, and the ⅜-in. size, which lists for $9 per 100 ft., is quoted at 55 per cent discount.

Sockets.—Schedule material is moving steadily with no new prices announced. In standard-package lots pull-chain sockets sell for 33 cents, key sockets for 18 cents each, and keyless sockets for 16 cents each.

Fans.—There is every promise of a good fan business this year. Jobbers report that a number of dealers have already reordered and sales are running considerably ahead of those of last year.

CHICAGO

Reports from the majority of dealers indicate that, while the electrical market has sustained its previous three weeks of good business, the local conditions both in demand and supply have changed little. The activity on conduit and rubber-covered wire is still strong owing to the building of new residences. Advances were noticed on lock nuts, bushings and conduit boxes, following the recent rise in steel prices. Mill-type lamps are moving steadily since the railroads and industrials are back again in the buying field.

A contract for about 15,000 tons of structural steel was awarded recently to the Fort Pitt Bridge Works. This material will be used for the new Stevens Hotel to be built on Michigan Boulevard.

Conduit.—The conduit situation is approaching the point, at least among the better class of jobbers, where a fixed price of $43 per 1,000 ft. for the ½-in. black pipe in 5,000-ft. lots is being maintained. Several jobbers say they prefer to stay out of this market entirely rather than to sell at a loss, since price competition has been very active during the past months. The demand for conduit is steady because of the activity in the building industry. Stocks are good.

Wire.—No price changes were noticed on wire this week, and the call for rubber-covered No. 14 has been up to the standard maintained during the last three weeks. It is available in 5,000-ft. lots at $6 per 1,000 ft. The supply is also good. Movement on weatherproof and bare wire, while active, has not shown any pronounced changes. Bare wire is selling around 16½ cents per pound.

Flexible Armored Conductor.—Activity in the building of new homes has relegated this material slightly to the rear, since the call for wiring materials has been mostly for conduit and rubber-covered wire. However, dealers are reporting fair shipments on the two-wire, double-strip in 5,000-ft. lots for $43 per 1,000 ft. Stocks are ample.

High-Tension Equipment.—Orders for a 6,000-kva., 33,000-volt outdoor substation and several smaller ones of the same voltage, all for the Middle West, were accepted during the week by one manufacturer. This company also speaks of a good business on 13,200-volt outdoor disconnecting switches and on farm-line equipment.

Sockets.—No price changes have occurred in this material, but jobbers say that the demand due to the building activity has been good. In standard packages of 250 the pull sockets sell for $33 per 100. The key socket is quoted at $18.15 per 100 and the keyless at $16.50 per 100. Stocks are good.

Dry Cells.—The radio requirements have produced a fair but steady call for these cells. They are still available in barrel lots for $30.52 per 100.

Lock Nuts and Bushing.—This material has seen an advance of about 10 per cent, along with the increased strength in the steel industry.

Lamps.—Dealers report that, while a slump has been felt, the market has been fairly vigorous because of the increased buying by the railroads and by the industrials. The demand for the daylight bulb has been steady since most department stores are becoming aware of the advantages of this lamp in their display windows.

Conduit Boxes.—Prices on conduit boxes have been advanced about 7 per cent, but the demand is unaltered.

BOSTON

Little change in trade is apparent beyond a gradual expansion in the demand for wiring materials and a healthier tone in appliance sales. Building continues to grow in New England, but so far electrical supplies have not been heavily drawn upon on account of the early stages of work in progress. Building and engineering contracts for the week ended May 16 totaled $7,118,300 against $3,796,500 for the same week last year. Only one similar week in the past twenty years equals this record. Activity in the paper industry is good and metal-working plants are a little busier. Retail trade is fair and in some textile centers a few employees long on strike have returned. By and large there is little real change in the cotton-manufacturing situation. Prices of electrical supplies reflect an advance of about 5 per cent in rubber-covered wire and stiffening quotations on bare copper and weatherproof wire. The local demand for electric ranges and for electrically driven refrigerating apparatus reflects some improvement. Central-station outputs in representative cases show increases of 15 to 30 per cent or more above this time last year.

Electric Ranges.—Interest in ranges has broadened considerably during the past few weeks. One central-station company recently reported a sale of twenty-four ranges for apartment-house service on a repeat order. Competition is sharp among manufacturers, but the outlook appears good for the season.

Motors.—Nothing beyond small-order sales and in sizes below 10 hp. or thereabouts features the market. Considerable "shopping around" is evident among purchasers, and a good deal of effort is being expended on sales engineering analyses in the hope that the groundwork is being laid for much more future business than is at the moment in sight.

Wire.—Sales of weatherproof wire and rubber-covered wire are fairly good. Prices tend to stiffen on all wire, owing to the advance in copper. Monday's base on weatherproof was about 15½ cents, and the latter was moving at about $6.60 per 1,000 ft. in 5,000-ft. lots. Bare copper wire base was about 14 cents. Outside construction work is hitting its stride and central-station companies are buying better, but under sharp competition.

Bells and Buzzers.—Demand is light, with good stocks. Price sheets were recently issued in jobbing circles reflecting some readjustments, without marked changes up or down. Class A, iron-box, 2½-in. buzzers are moving slowly at 67 cents in lots of 100 or over. Duplex signals in lots of 10 to 100 are quoted at $1.

Motor-Driven Refrigerating Plants.—One dealer reports sales so far this year exceeding all last season's and has set a minimum of 100 with confidence that it will be exceeded. The advent of smaller sizes of equipment has aroused considerable popular interest.

Electric Vehicles and Industrial Trucks.—A revival of interest is evident in Boston, and increased sales are anticipated soon. Present demand for industrial trucks is very light, though occasional tenders are in demand from large mills. Battery-renewal business is moderate on road trucks.

Appliances.—Vacuum cleaners and washing machines are moving better, and the lighter staple appliances are in fair demand. Small sales of motor-driven sewing machines are features of confidential reports in central-station circles, and flatirons are moving actively. Fans are about to move after a long-delayed warm season. Portable lamps are still moving well considering the season.

ATLANTA

General conditions in the Southeast continue to improve, the past week being marked by unmistakable symptoms of quickening business activity and general optimism. Building permits issued in Atlanta for the first two weeks in May had a valuation of $788,285, aggregating about $200,000 more than for a corresponding period in April. Home building still leads all other classes, and the "Own your own home" exposition that was held in Atlanta last week is expected further to stimulate this movement.

The peach crop of Georgia is beginning to move, and it is expected that it will run between 7,000 and 8,000 cars. This should bring $6,000,000 to $8,000,000 to the growers in the neighborhood. Watermelons are already moving out of Florida, and it is expected that Georgia's crop will be in the market during June. Cantaloupes will move in large quantities during the next thirty days, Georgia alone shipping approximately 3,500 cars. From these three sources—that is, from peaches, watermelons and cantaloupes—the Southern farmer will receive within the next sixty to ninety days from $25,000,000 to $35,000,000. The larger portion of this money will be spent for farm and home equipment.

All electrical jobbers report their business as steadily improving and are very optimistic over the outlook. A few sales campaigns are under way and others will be launched, which should boost sales considerably.

Lighting Fixtures.—Industrial, commercial and residential lighting fixtures are all moving satisfactorily, with the commercial and residential types particularly good. This line is expected to have an even brisker movement during the next thirty days. Stocks throughout the territory are in fine shape.

Portable Lamps.—These have been very slow for several months past but are now beginning to pick up. Both the metal and silk-and-mahogany types are moving, with one jobber reporting the small, or boudoir, lamp the best seller at present. All stocks are in excellent condition.

Fans.—A rainy, cool snap during the past week temporarily slowed up the movement of fans. The movement in general, however, is very brisk and jobbers are expecting an unusually good season. The 16-in. oscillating type is the best seller at this time. Stocks and shipments are good.

Lamps.—While the movement of lamps at this season of the year is always slow, all jobbers report sales holding up remarkably well, with the demand distributed throughout the line. Stocks are good.

Vacuum Cleaners.—Vacuum cleaners are not showing up as well as was expected, jobbers reporting few sales. A sales campaign started on May 1 should stimulate the movement shortly. Stocks and shipments are satisfactory.

Heating Devices.—Owing to campaigns, the entire line of heating devices is moving very satisfactorily, and one jobber reports small soldering irons for radio use as particularly good. No changes in prices are reported and stocks and shipments are good.

Distribution Transformers.—There has been a slight slump here, though jobbers still report a fair movement in the popular sizes. Sizes larger than 25 kw. continue rather slow. Stocks and shipments are satisfactory.

"White-Way" Lighting Equipment.—Only a fair amount of interest is being displayed at present, though jobbers expect the movement to pick up. No price changes are reported and shipments are good.

ST. LOUIS

Increased activity in business generally is indicated by the volume of orders being placed for rolling stock by the various railroads and transportation companies, concerns in this territory receiving large orders last week for both freight and passenger equipment. One single order was for 2,000 refrigerator cars, the estimated value of which is $5,000,000. The electrical jobbers are receiving their share of the increased business, but there has been no spectacular buying of electrical goods. Improved sales are found in motors and other industrial equipment, and the demand for house-wiring supplies is continually advancing.

The Union Electric Light & Power Company is doing extensive work this year in preparation for heavier loads. Test borings have been completed for its Cahokia steam plant, to cost $8,500,000, and construction work is expected to be actively under way within a month. In addition, substantial increases in substation capacity are planned, and a full-automatic converter station is now under construction to serve additional load in the down-town district. This construction work will, of course, directly result in the sale

of a large amount of electrical equipment, and it also indirectly connotes the possibilities of a large volume of sales of all classes of electrical goods to the power users in this territory.

Wire—A stiffening of prices is noted, especially in No. 14 rubber-covered, for which one jobber is asking $6.50 per 1,000 ft. in 5,000-ft. lots. Individual orders are increasing in size, several last week being for 100,000 ft. Other sizes of rubber-covered are quoted as follows, for 5,000-ft. lots: No. 12, $8.50 per 1,000 ft.; No. 10, $11.25 per 1,000 ft.; No. 8 $15.05 per 1,000 ft. The prevailing base on bare wire is 17 cents per pound, and that on weather-proof around 16 cents per pound.

Cable.—The demand has been especially strong, and one large order for 27,000-volt three-conductor cable was placed last week. Deliveries are being made longer as the factories become more heavily loaded.

Insulators.—Immediate deliveries are obtainable in all usual items. Prices remain unchanged, sales show some increases, and inquiries are very encouraging.

Pliers.—Increased wiring and line work is causing some improvement in demand, more particularly for the smaller sizes, but the total movement is still slow. Klein's 6-in. side cutter sells for $2.80 and the 8-in. side-cutter for $3.75.

Transformers.—Substantial improvement is found in the sale of distribution transformers, virtually normal production being reported by one local manufacturer. Several inquiries are pending which should soon result in the sale of large units of 13,200-volt and higher ratings.

Fans. — Cool weather the past week retarded the usual early sales. Dealers' stocks left over from last season were quite small, and they have purchased new stocks of reasonable amounts to meet the opening demand. Conservatism nevertheless controls the buying.

Flatirons.—Without special campaign work the demand continues comparatively strong, and sales are about 10 per cent better than they were this time last year. Stocks in the hands of both dealers and jobbers remain low but ample.

SAN FRANCISCO

Building construction remains at high tide. Many big jobs are approaching completion, but there are more smaller jobs to take their place and the month-by-month value of building permits is increasing. The growth of certain hitherto sparsely settled semi-suburban districts is amazing. The approach of the fruit season has meant the renovation of many canning and packing plants and a good season is expected. Another seasonable source of electrical business is the preparation of summer resorts for what is expected to be an excellent year. Tourist bureaus report one of the earliest and largest travel inquiry seasons they have ever known.

Schedule Material.—The campaign for convenience outlets is showing results, although these have not yet acquired the momentum expected. Certain districts, such as the Richmond district of San Francisco, are being built up by contractors who sell not vacant lots but lots with completed residences and are therefore not particular about equipping such residences with the latest electrical features unless they are visible, such as fixtures. The result is that much of this work is being done by "mushroom" firms content to work for the equivalent of a day's wages per day and which figure their jobs accordingly. However, the campaign will eventually reach the public in such a thorough way that this condition will be remedied. Big sales of all varieties of staple material are reported with stocks adequate for prompt deliveries.

Conduit Fittings.—Changes in price have caused a run on standard fittings and standard boxes, but local stocks have been improved so that prompt deliveries can now be made. This was not the case a month or so ago when even some of the standard boxes and covers were short. The big jobs are well taken care of by Eastern shipments, but the smaller jobs and shelf or bin stocks are the subject of much competition and are split up among a variety of firms in addition to jobbers.

Household Appliances.—The California Electrical Co-operative Campaign is putting over a "June bride" week from June 5 to 10, at which time the desirability of electrical appliances for wedding gifts will be exploited.

PORTLAND—SEATTLE

The employment situation, which was rather serious last winter, has virtually ceased to create alarm as summer approaches. Very little forced lack of work now exists. The first one of the Washington coal mines closed when the strike was called has again resumed operations, but on an open-shop basis. The water-front strike which has been on for several weeks in Portland is quiet. Cargoes are being handled with little delay with the exception of vessels of the Shipping Board, which discriminates against the employers' union because of existing conditions and refuses to allow its ships to be worked.

Lumber production for the week ended May 13 was 1 per cent above normal. New business for the week was 15 per cent above production, and shipments were 3 per cent above production. An encouraging feature of the lumber situation is a considerable increase in the percentage of rail to water shipments reported for the past week over former weeks. This clearly indicates a revival of trade with the interior. Several transmission lines are under construction and a number of others are contemplated. Some important telephone toll lines are under construction, and a 5-mile extension of the Yakima Valley electric railway line is being put in. These are encouraging signs.

Sales in the electrical trade have been steady during the week, with a volume of business about equal to that of previous weeks. Contractor-dealers report business good, and in some cases excellent, without considering the stimulation due to radio. Most dealers are handling radio equipment, and this has been very active. Fixture and wiring business continues to increase.

Knobs.—No. 5½ "Nail-it" knobs are quoted at $22 per 1,000 in unit packages of 500. No. 5½ solid knobs are quoted at $9.65 in similar quantities.

Tubes.—Tubes 3 in. x $\frac{5}{16}$-in. are quoted at $5.85 and 4 in. x $\frac{5}{16}$-in. tubes at $7.50 per 1,000 in quantities of 500.

Cleats.—Two-wire and three-wire porcelain cleats are quoted at $17 per 1,000 in unit packages of 250.

SALT LAKE CITY—DENVER

There was not much change in the market situation as reported last week. Labor troubles that were brewing in the coal camps are quieting, with prospect of increased production. Non-employment is growing less each week as farming activity and construction work gets under way. In some phases of home building a shortage of skilled labor has been experienced. Wages are fair, giving steady workers a buying power that is reflected in a better market. The report comes from Idaho, the state that was hardest hit of all of the Intermountain commonwealths, that a financing corporation is granting ample loans to bridge the time between planting and harvest. Growers of various agricultural crops will now be able to maintain their regular standard of acreage. A year or two of good harvests should get the "Gem State" well on the way toward recovery.

Electrical merchants in the Salt Lake City jobbing territory are all on the qui vive about the Rocky Mountain electrical exposition planned for Oct. 2 to 14. An electrical illumination display that will cost more than $10,000 is to be installed for the occasion. It is planned to induce manufacturers of electrical products in every part of the country to exhibit their products, with the view of introducing them. An extensive advertising campaign, involving both periodicals and direct-by-mail pieces, has been worked out. Of much encouragement to business interests of this territory is the fact that the metal market is steadily improving, with the demand increasing and prices stiffening. Production will be on a considerably better basis in the near future.

Radio.—Jobbers of and dealers in radio are now in a better position to meet orders. A half dozen brands are now offered on the retail market.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Line-Hardware Manufacturer Starts Production

The Seyler Manufacturing Company, Sharpsburg, Pittsburgh, has been organized and has moved into its new factory building. The plant has 65,000 sq.ft. of floor space which will be devoted exclusively to the manufacture of hot galvanized pole-line hardware, "Bo-arrow" arms, pins, house brackets, mast irons, secondary racks, etc. The company was organized by Carl Seyler, formerly general manager and vice-president of the Hubbard Company, Pittsburgh. Associated with Mr. Seyler is N. C. Husted, in charge of sales engineering. Mr. Husted was also formerly with the Hubbard Company. The company has been in production for over a month, and, it is stated, is now in a position to make prompt shipment.

Westinghouse to Furnish Only Copper Cooling Coils

In order to protect its customers, the Westinghouse Electric & Manufacturing Company announces it has refused to furnish any more iron cooling coils with water-cooled transformers. Heretofore the practice has been to furnish either copper or iron cooling coils, the former being somewhat more expensive.

In the future, copper coils only will be furnished, but at the same price as previously charged for iron. The decision to furnish copper coils only was made when it was ascertained that a number of Westinghouse customers bought iron cooling coils instead of copper cooling coils to save money and that this frequently resulted in trouble for the customers because of the rusting or clogging of the iron cooling coils.

Johns-Manville Johns-Pratt Sales Arrangement Canceled

The arrangement whereby Johns-Manville, Inc., for many years has acted as exclusive selling agent for the electrical products manufactured by the Johns-Pratt Company, Hartford, Conn., has been canceled, effective June 15, according to a joint announcement of both companies. The announcement states that, owing to changing business conditions in the electrical trade, the companies have decided to manufacture and market their respective products separately.

"When the connection was established in 1887," it is explained, "it was a necessary arrangement to assure a widely distributed stock of electrical products. Today, to effect the greatest economy to all concerned, direct sale by the manufacturer through organized distributers has become necessary. Both parties to the agreement feel that they can serve the trade more effectively and economically by concentrating on their own lines."

Belden Company Moves Into New Magnet-Wire Plant

The Belden Manufacturing Company during the last week in April moved the sales department for its magnet-wire and dry-cotton tape departments from the main office, 2300 Southwestern Avenue, Chicago, to its new magnet-wire plant, 4625 Van Buren Street, in that city. By locating the sales department for these products at the new factory, the company announces, closer touch can be maintained between production, sales and deliveries and better service rendered the trade. The new plant, which will be devoted to the manufacture of magnet-wire and dry-cotton tape, has a total floor space of 112,000 sq.ft. It is situated on the Belt Railway of Chicago, affording very good shipping facilities. The other products of the company, such as insulation, insulating parts and various types of wire and cable, will continue to be made at the main plant on Southwestern Avenue.

Modern Electrical Devices Discussed at Jobbers' Meeting

About forty electrical jobbers representing the Erner Electric Company of Cleveland held a meeting in South Bend, Ind., recently. The principal address was made by L. A. S. Wood, manager of the illuminating section of the Westinghouse Electric Company. Business sessions for the purpose of educating the salesmen and jobbers on modern electrical devices and showing recent developments of the trade were held, and a series of meetings in each of the company's branches are being planned for the same purpose.

General Electric in Patent Suit Against Cutler-Hammer

A suit has been brought against the Cutler-Hammer Manufacturing Company alleging infringement of Abbott patent No. 1,367,341, covering what is known as sheath wire. The bill of complaint was filed in Milwaukee on Feb. 21, 1922. The complainants in the case are the General Electric Company and the Edison Electric Appliance Company.

Slate Producers Form an Association

At a meeting held recently at the Hotel Commodore, New York City, a temporary executive committee was elected by producers of slate for the purpose of forming a National Slate Association. Oliver C. Bowles of the United States Bureau of Mines presided. The purpose of the association is to mobilize the entire slate industry into a body which will extend and promote the use of slate and see that the public is fully informed of the advantages and economies of this product.

The following were elected members of the temporary executive committee: W. H. Keenan, Bangor, Pa., chairman; E. R. Norton, Granville, N. Y.; G. F. Barnard, Boston; N. M. Male, Pen Argyl, Pa.; G. H. Shinville, Fairhaven, Vt.; F. C. Sheldon, Granville, N. Y.; R. C. Berlin, Slatington, Pa., and A. H. Morrow, Paulet, Vt., treasurer.

Russell Electric in New Quarters

The Russell Electric Company, Chicago, obtained a fivefold increase in floor space when it moved its manufacturing quarters from 140 West Austin Avenue to 340 West Huron Street. President T. C. Russell stated to a representative of the ELECTRICAL WORLD that this increase was necessary because 1922 business so far was double that of the same period last year. To take care of this expansion, the capital stock has also been increased from $2,500 to $100,000.

New Head for Robbins & Myers Company

The Robbins & Myers Company, manufacturer of fans and small motors, Springfield, Ohio, has announced the decision of C. S. McGilvray, president, to accept appointment as chairman of the board of directors and the acceptance by F. S. Hunting, general manager of the Fort Wayne division of the General Electric Company, of the presidency. Mr. Hunting has been in charge of the production of small motors for the General Electric Company for a number of years and is considered exceptionally fitted for the duties of president of the Robbins & Myers Company, according to the announcement. There are no other changes in official personnel, Wilbur J. Myers and H. E. Freeman remaining as vice-president and treasurer respectively.

Sales of the company have increased recently, owing partly to seasonal influences, but a successful fan season is predicted by officials. Bookings for April were in excess of $500,000, as compared with $180,000 in January. A satisfactory profit for the month was reported, after all fixed charges and depreciation had been deducted. It is reported that a refinancing program is under way which will place the company in an exceptionally sound position.

Most of the present indebtedness is to be refunded. New York, Chicago and Cleveland bankers are understood to have underwritten the financing.

Stock of Johns-Pratt Company Acquired by Colt

The Colts Patent Fire Arms Manufacturing Company of Hartford, Conn., has just purchased the Johns-Pratt Company of Hartford, at a price said to amount to $275 per share for the stock of the latter company. No announcement has been made as to whether or not there will be any change among officials of the Colts Patent Company with its new addition. It is understood that the Hart & Hegeman Company, whose president, Shiras Morris, is also president of the Johns-Pratt Company, is not involved in any way in this purchase.

The De Laval Company Reports Increasing Business

The last part of 1921 and 1922 to date have shown an increased demand for the products of the De Laval Separator Company, according to the *De Laval Centrifugal Review*, the house organ of that company. One of the factors in this greater activity has been the demand on the part of central-station companies for transformer-oil purifiers.

"Sales have shown a steady increase," it is stated, "and each month's business for the last six months has been far ahead of the corresponding period of the year previous. The number of new installations of transformer-oil purifiers has shown a steady increase. The larger central stations distributing electricity must by some method maintain the dielectric strength of oil in their transformers, and the smaller plants are now recognizing the need for means of purifying lubricating oil. Many new installations of the De Laval centrifugal purifiers are being made."

Booth Electric Triples Capacity

The Booth Electric Company, Chicago, is now at 411 North Wells Street, having moved from 326 Madison Street. W. K. Booth, the secretary of the company, stated recently to the ELECTRICAL WORLD that this change increased the floor space of the company about three times. This addition will provide better means for assembling the electrical furnaces manufactured by the company.

Wadsworth Electric Company to Build New Plant

The Wadsworth Electric Company, Covington, Ky., is planning the erection of a plant able to handle a volume of business five times greater than the capacity of its old building. This announcement was made by George B. Wadsworth, president of the company, following the announcement of the sale of its present plant on Pike Street. The company manufactures saf · and meter switches.

Corporation to Carry on Carroll Electric Business

The Carroll Electric Company, electrical supply jobber, 714 Twelfth Street, N. W., Washington, D. C., has incorporated its business as of April 1, 1922, according to the announcement of Louis D. Carroll, vice-president. The new corporation will retain the name of the old partnership and will continue to operate as in the past under the partnership agreement. The officers are: Harry D. Carroll, president; Louis D. Carroll, vice-president, and Harry W. Clayton, secretary. The branch offices of the company in Baltimore and Norfolk will be maintained as before.

Tafel Electric Now Occupying Own Building

The Tafel Electric Company, electrical supply jobber, Louisville, Ky., recently moved into its own building at 329 Main Street, the change being necessitated by increasing business. The new quarters consist of a four-story building, 38 ft. x 225 ft., which has been the property of the company for the past two years. The company is one of the older electrical houses of the South, but has been in the electrica jobbing business only since 1914, when the contracting and repairing departments were dropped. The territory covered by the company includes all of Kentucky, Tennessee and southern Indiana, and it is stated to be the only exclusively wholesale electrical jobbing house in Kentucky. Paul Tafel is president and general manager and E. W. Smith is vice-president.

Reorganization of Electrical Warehouse Company

Announcement has been made by the Electrical Warehouse, Inc., 452 West Larned Street, Detroit, that Waldso Turner, the former president and treasurer, has retired from the management. Mr. Turner will devote all his time to the Turner Engineering Company, of which he is president and treasurer. F. Zinsmeyer has been elected president of the company, and T. J. Riley is the new vice-president and assistant general manager. This company serves as wholesale distributer for thirteen well-known manufacturers.

Langmuir Patent Suit Injunction Against Incandescent Products

The General Electric Company has been granted a preliminary injunction by the United States District Court for the District of New Jersey in its suit against Incandescent Products, Inc., Arlington, N. J., for infringement of its Langmuir gas-filled lamp patent No. 1,180,159.

The defendant was alleged to have been selling imported Austrian lamps and also lamps of its own manufacture, the last under the trade name "Ipco," and to have been infringing the patent in question by doing so. The court finds the Langmuir patent infringed and Judge Bodine's views are summarized in the closing paragraph of the opinion granting the injunction.

"The plaintiff," the opinion states, "having established its patent in other jurisdictions, and having shown a slavish imitation by the defendant of the product manufactured under its patent, is entitled to an immediate preliminary injunction."

Music Roll Company to Make Radio Apparatus

Arrangements for the manufacture of a complete line of radio sets and equipment are being made by the Q-R-S Music Company, Kimball Building, Chicago, Ill. A portion of the local plant as well as factories at New York and San Francisco will be converted for this production, with the installation of necessary equipment at an early date. Another plant now in course of erection at Toronto, Canada, will be partially given over to radio manufacture. To carry out the details of the expansion and provide funds for equipment, etc., the company is disposing of stock totaling $255,000. Lee S. Roberts is vice-president.

Consolidation of Fiber Interests

The Fibre Conduit Company, Orangeburg, N. Y., has acquired the plant of the American Fibre Conduit Corporation at Fulton, N. Y., and the conduit manufacturing business of the Johns-Manville Company at Lockport. N. Y., and has appointed Johns-Manville, Inc., as sales agent for its products, effective as of May 15, 1922.

The Broderick & Bascom Rope Company, St. Louis, manufacturer of wire rope, is planning to rebuild its plant, recently destroyed by fire with a loss of about $300,000. The St. Louis operations are temporarily suspended.

Pattison Brothers, consulting electrical engineers, have moved their offices to 304 Madison Avenue, New York.

The O. Z. Cable Support Company, through M. J. Cafiero, president, announces the new location of its factory and general office at 584 Decatur Street, Brooklyn, N. Y.

The Toronto Laundry Machine Company, Toronto, Canada, has sold the patents and good will of the "Jack-Frost" electric refrigerating business to the Jack-Frost Ice Machine Company, Ltd., Toronto. This newly formed company has a capital of $1,000,000.

The Beverly Lights Corporation, Providence, R. I., manufacturer of ornamental lighting fixtures, has appointed Travis Welch, 180 Montgomery Street, San Francisco, Western agent.

The Electrical Specialty Company, Inc., factory distributer, with offices in San Francisco, has removed its offices from the Underwood Building to 75 Fremont Street, where larger quarters will permit the company to handle its growing business.

Foreign Trade Notes

BRAZILIAN HYDRO-ELECTRIC CONGRESS PROPOSED.—The organization of a hydro-electric congress in connection with the centennial exposition has been proposed by Dr. Simoes Lopes, Minister of Agriculture of the Brazilian government. Commercial Attaché Schurz reports to the Department of Commerce from Rio de Janeiro.

EXPANSION OF ELECTRICAL INDUSTRY IN FORMOSA.—Seven electric Companies in Formosa, according to *Commerce Reports*, have a total output of 16,398 kw., with a total of 119,400 kw. under construction. The Taiwan Denryoku is the largest company, with an output of 14,525 kw. and a capital stock of 30,000,000 yen. It plans to increase its output by 111,000 kw.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

There is a market in India (No. 2,015) for electric lamps and all sorts of electric appliances, etc.

An agency is desired by a company in Sweden (No. 2,020) for the sale of technical novelties, electrotechnical material, machinery and other articles suitable for an agency firm.

The purchase is desired by a firm in England (No. 2,022) of steel tubes and electrical accessories in large quantities.

A government official in Mexico (No. 2,023) desires to secure the representation of firms for the sale of construction material (iron and steel), wire cable, etc.

Numerous inquiries for electrical goods have been received by the Bureau of Foreign and Domestic Commerce, Washington, D. C., of which detailed information may be obtained by referring to Nos. 2,067-2,072.

The purchase is desired by a business man in Canada (No. 2,158) of a 30-volt traveling motion-picture machine and generator for same.

A business man in Canada (No. 2,170) wishes to secure an agency for complete wireless-telephone receiving sets suitable for home entertainment.

A concern in Belgium (No. 2,175) desires to secure an agency or consignment for electrical high-tension material, including generators, motors, transformers, etc.

A mercantile firm in England (No. 2,185) desires to purchase electrical accessories and domestic electrical appliances.

An agency is desired by a firm in France (No. 2,189) for the sale of electrical mining machinery and supplies, mica and asbestos, fiber board and electrical medical appliances.

A commercial agent in Canada (No. 2,204) desires to secure an agency and purchase complete wireless-telephone receiving sets suitable for home entertainment.

TRANSFORMERS FOR AUCKLAND, NEW ZEALAND.—The Public Works Department of Auckland, New Zealand, will receive tenders until July 4, the *Electrician* states, for three 1,320 single-phase transformers, complete with accessories.

ELECTRIC EQUIPMENT FOR BUENOS AIRES, ARGENTINA. — The Municipal Council of Buenos Aires, Argentina, will receive bids until June 28, according to the *Electrical Review*, for equipment for a hydro-electrical generating station and a transformer station.

STORAGE BATTERY EQUIPMENT FOR AUSTRALIAN RAILWAYS.—Tenders will be received by the Victorian Government Railway Commissioners, Melbourne, Australia, until July 5, according to the *Electrical Review*, for storage-battery, truck and battery-charging equipment for the Victorian Railways.

PROPOSED HYDRO-ELECTRIC PLANT FOR FRANKFORT, SOUTH AFRICA.—The municipality of Frankfort, Orange Free State, South Africa, according to the *Electrical Review*, is asking for tenders for a proposed hydro-electric scheme. Particulars may be obtained from W. Ingham, consulting engineer, 101 Consolidated Buildings, Fox Street, Johannesburg, South Africa.

EQUIPMENT FOR ELECTRIC PLANT, MELBOURNE, AUSTRALIA.—Tenders will be received by the Victorian Electricity Commissioners, Melbourne, until Sept. 1, for furnishing five surface feed-water heaters, six surface vapor condensers and twelve feed-water evaporators.

EQUIPMENT FOR ELECTRIC PLANT FOR GRAHAMSTOWN, SOUTH AFRICA.—The Council of Grahamstown, Cape Province, South Africa, will receive tenders until Sept. 1, the *Electrical Review* states, for alternators, switchboard, transformers, cables, etc., for the electric power plant at Grahamstown. Specifications may be obtained from F. G. Clarkson, town clerk.

TELEPHONE EQUIPMENT FOR MELBOURNE, AUSTRALIA.—Tenders will be received by the Postmaster-General's Department, Melbourne, until Oct. 17, according to the *Electrical Review*, for furnishing automatic switchboards and accessories for two suburban telephone exchanges at Melbourne.

New Apparatus and Publications

WELDING RODS AND ELECTRODES.—The Page Steel & Wire Company, Monessen, Pa., has issued catalog No. 500, covering the "Page-Armco" welding rods and electrodes for oxy-acetylene and electric welding.

WIRE.—The American Insulated Wire & Cable Company, Twenty-first Street and Sangamon Avenue, Chicago, has recently put on the market a line of copper antenna wire and copper cable for radio use.

OIL ENGINE.—Bulletin No. 10,004, published by the Ingersoll-Rand Company, 11 Broadway, New York City, describes the Price type "PO" horizontal, single-cylinder, single-acting, direct-injection oil engine.

RENEWABLE FUSES. — The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is distributing a small booklet entitled "Shurvent Protection," covering its "Shurvent" renewable fuses.

OUTLET RECEPTACLES.—Pass & Seymour, Inc., Solvay, N. Y., are distributing a leaflet calling attention to the "P & S" outlet receptacles for the modern bathroom.

BUFFING MACHINE.—The Van Dorn Electric Tool Company, Cleveland, has added a heavy-duty ball-bearing buffing machine to its line of electrically driven machines.

STOVE.—A new electric stove, known as the "Allmur grill," has been brought out by the Allmur Manufacturing Company, Marion, Ind. This stove is being distributed by the Standard Electric Sales Company, 105 West Monroe Street, Chicago.

RADIO SWITCHES.—The Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn., is distributing a six-page folder describing its various types of radio switches.

New Companies

THE NORTH SHORE ELECTRIC COMPANY, Cocoa, Fla., has been incorporated with a capital stock of $10,000. The officers are: Frank L. Brown, president; N. B. Brown, vice-president, and William H. Berg, secretary.

THE WALMORE ELECTRIC COMPANY, Sanford, N. Y., has been organized by Edward Williams, and M. H. Wagner, of Wheatfield, and others, to supply electricity in Wheatfield, Niagara and Lewiston.

THE WESTON (PA.) LIGHT & POWER COMPANY has been organized to install and operate an electric light and power plant in Weston. George Puhak, Hazleton, Pa., is president.

THE MISSISSIPPI VALLEY POWER COMPANY, Fort Smith, Ark., has been incorporated with a capital stock of $1,700,000 to take over the property and holdings of the Commonwealth Public Service Company, Fort Smith. The officers are: D. C. Green, president; George Sengel, Jr., vice-president, and L. J. Noble, secretary.

THE LEBANON (VA.) LIGHT COMPANY has been incorporated with a capital stock of $10,000 to furnish electricity in Lebanon. T. A. Gilmer is president and J. R. Wham, secretary.

THE COOPER ELECTRIC COMPANY, Hilton, N. Y., has been incorporated with a capital stock of $50,000 to furnish electricity in the territory adjacent to Hilton. The officers are: John E. Cooper, president; John H. Cooper, vice-president; Orange Green, treasurer, and Corrine Kintz, secretary.

THE WALMORE (N. Y.) ELECTRIC COMPANY has been incorporated with a capital stock of $30,000 by E. L. Haseley, R. Hewitt and A. B. Aure. Tuttle, Rice & Stockwell, Niagara Falls, are attorneys. Walmore has not a post office.

Record of Electrical Patents

Notes on United States Patents

(Issued May 2, 1922)

1,414,373. ADAPTER FOR CALLING DEVICES; Harry W. Pugh, New York, N. Y. App. filed Nov. 14, 1919. For sending automatic telephone impulse signals.

1,414,381. HUMIDOR; John V. Sprague, Pittsburgh, Pa. App. filed Jan. 8, 1917. Moistening contents of tobacco cases.

1,414,391. MEANS FOR AND METHOD OF TESTING UNBALANCE; Herman A. Affel, Brooklyn, N. Y. App. filed Sept. 23, 1919. On multiplex carrier transmission circuits.

1,414,397. TESTING APPARATUS; Fred H. Best, Westfield, N. J. App. filed May 14, 1920. For determining transmission efficiency of telephone and line.

1,414,401. PROCESS FOR THE DESTRUCTIVE DISTILLATION OF COAL AND OTHER MATERIAL; Peder Farup, Slemdal, Norway. App. filed Nov. 4, 1920. Combination of direct and indirect electrical heating.

1,414,403. SYSTEM OF CONTROL; Adolph A. Gazda, Wilkinsburg, Pa. App. filed Dec. 8, 1917. Utilizes a series field for dynamic braking upon failure of power.

1,414,408. MOTOR-CONTROL SYSTEM; Albert L. Harvey, Braddock Township, Pa. App. filed Nov. 4, 1918. For governing the operation of planers, etc.

1,414,409. MOTOR-CONTROL SYSTEM; Albert L. Harvey, Wilkinsburg, Pa. App. filed July 7, 1920. Control of one motor by several controllers widely separated.

1,414,413. ELECTRICAL SWITCH; Charles H. Hodgkins, Pittsburgh, Pa. App. filed Nov. 16, 1917. Remote control for reclosing air circuit breakers.

1,414,414. LANTERN; Gustave Humber, Denver, Col. App. filed June 26, 1919. Trainman's lantern with red and white bulbs.

1,414,415. ELECTRIC LANTERN; Gustave Humber, Denver, Col. App. filed Dec. 2, 1919. Framework for lantern.

1,414,422. MOTOR-CONTROL SYSTEM; Edwin S. Lammers, Jr., Wilkinsburg, Pa. App. filed Jan. 16, 1919. For several motors designed to run in synchronism.

1,414,423. ELECTROLYTIC SEPARATION OF METALS; Carl Langer, Woolhampton, England. App. filed April 11, 1921. Two or more metals recovered simultaneously.

1,414,442. TELEPHONE TRANSMITTER; Louis Steinberger, Brooklyn, N. Y. App. filed June 26, 1919. Construction of cap.

1,414,494. ELECTRIC WATER HEATER; Frederick S. Arntfield, Toronto, Ontario, Canada. App. filed May 17, 1921. For small amounts of water.

1,414,510. STORAGE BATTERY; Ralph H. Grant, Dayton, Ohio. App. filed Sept. 9, 1918. Relieves cover strains.

1,414,522. MAGNETIC CHUCK AND METHOD OF MAKING THE SAME; Ralph L. Morgan, Worcester, Mass. App. filed May 15, 1918. Openwork of non-magnetic material with pole pieces in spaces.

1,414,548. DEVICE FOR RESTORING TROLLEY WHEELS TO TROLLEY WIRES; Donald L. Chestnut, Seattle, Wash. App. filed Sept. 17, 1921.

1,414,612 and 1,414,613. SIGNAL FOR MOTOR VEHICLES; Emanuel Auflero, Brooklyn, N. Y. App. filed Feb. 26, 1921. Horn with motor-vibrated diaphragm.

1,414,629. WIRELESS DUPLEX SIGNALING SYSTEM; Mihran M. Dolmage, Washington, D. C. App. filed July 15, 1918. Two-way wireless telephone.

1,414,652. REGULATING SYSTEM FOR ALTERNATING-CURRENT CIRCUITS; Wallace B. Kirke, Schenectady, N. Y. App. filed June 10, 1920. For holding current or voltage constant.

1,414,658. X-RAY STAND; William Meyer, Chicago, Ill. App. filed Feb. 18, 1918. Adjustable to any desired point or angle.

1,414,659. CIRCUIT BREAKER; Benjamin M. Mooers, San Francisco, Cal. App. filed Sept. 19, 1917. For temperature protection.

1,414,676. PANELBOARD AND PANELBOARD CONSTRUCTION; Henry F. Starrett, Chicago, Ill. App. filed May 15, 1918. All current and potential conductors inclosed.

1,414,677. PANELBOARD AND PANELBOARD CONSTRUCTION; Henry F. Starrett, Chicago, Ill. App. filed May 15, 1918. Means for covering wire gutter.

1,414,686. CALL INDICATOR FOR AUTOMATIC TELEPHONE SYSTEMS; John G. Blessing, Chicago, Ill. App. filed July 10, 1916. Figures set up before operator.

1,414,709. RHEOSTAT; Gustav B. Reisbach, Milwaukee, Wis. App. filed April 2, 1921. Drum-type controller.

1,414,710. BATTERY PLATE; William Roberts, Akron, Ohio. App. filed March 17, 1921. Hard-rubber separators used.

1,414,741. ELECTRICAL VACUUM DISCHARGE DEVICE; Edwin W. Kelly, Oak Park, Ill. App. filed Oct. 6, 1919. Eliminates high break-down resistance of X-ray tube.

1,414,745. ELECTROLYTE INDICATOR FOR STORAGE BATTERIES; Reginald W. Millard, Meridan, Conn. App. filed June 17, 1919. Contact gage for all cells of battery placed on dashboard.

1,414,773. COIL RETAINER; Frederick C. Coseo, Columbus, Ohio. App. filed April 17, 1917. Field-pole construction of motors.

1,414,791. CONTROLLER FOR SYNCHRONOUS MOTORS; Edwin W. Seeger, Milwaukee, Wis. App. filed Feb. 12, 1921. Autoatic plugging connections for motoring upon interruption of running connections.

1,414,822. METHOD OF ELECTRICALLY WELDING GALVANIZED METAL SHEETS OR PARTS; Joseph Ledwinka, Philadelphia, Pa. App. filed Jan. 28, 1919. By spot-welding.

1,414,874. JUNCTION BOX FOR ELECTRIC SUPPLY MAINS; Alexander Graf, Berlin-Hermsdorf, Germany. App. filed Nov. 28, 1919. All wires held by a clamping device using one screw.

1,414,900. GENERATOR AND MOTOR SUPPORT; Amato N. Sammarone, Akron, Ohio. App. filed May 29, 1920. Support made of pressed-metal sheets.

1,414,939. STAMPING MACHINE FOR SIGNAL READING RIBBON; Wilfrid Dougall, Montreal, Quebec, Canada. App. filed March 13, 1920. For blind persons.

1,414,978. COMPUTING MACHINE; Ralph W. Bumstead, Brookline, Mass. App. filed Aug. 23, 1917. Perform's multiplication in one operation.

1,415,001. SPECIAL SERVICE TRUNK FOR AUTOMATIC TELEPHONE SYSTEM; T. G. Martin. App. filed July 9, 1917.
(Issued May 9, 1922)

15,351 (reissue). APPARATUS FOR TREATING ARTICLES BY DISRUPTIVE CONDUCTION; Franklin S. Smith, Philadelphia, Pa. App. filed April 6, 1922. For treating grains, furs, etc., by electricity.

1,415,012. ARC-WELDING SYSTEM; Alan M. Bennett, William B. Elliott and William O'Blenis, Westfield, N. J. App. filed March 14, 1918. Bucking series field to maintain arc resistence constant.

1,415,015. ELECTRIC WATER HEATER; Cyrus M. Bosworth, Cleveland, Ohio. App. filed Aug. 6, 1919. Attached to water tank in same manner as gas heater.

1,415,033. BATTERY; Harry T. Hipwell, Pittsburgh, Pa. App. filed Sept. 29, 1921. Container for dry cells and means for using all or each battery.

1,415,036. CHARGE OR BLOCK FOR USE IN PRACTICING PROCESSES INVOLVING CHEMICAL REACTIONS; William Hoopes, Pittsburgh, Pa. App. filed Sept. 19, 1919. For reactions between solid and gaseous bolies.

1,415,044. PERCUSSION-FIRING MECHANISM; George W. Nusbaum, Takoma Park, Md. App. filed March 18, 1920. By straight electrical firing.

1,415,076. INSULATING COMPOSITION; Robert R. Williams, Roselle, N. J. App. filed Dec. 26, 1919. Insulating material for submarine cables.

1,415,106. CIPHERING DEVICE; Lyman F. Morehouse, Montclair, N. J. App. filed July 23, 1920. For enciphering and deciphering telegraph messages.

1,415,139. STORAGE BATTERY; Gustave A. Baumetz, Cleveland, Ohio. App. filed Dec. 8, 1919. Separators hooked under successive plates.

1,415,159. LIGHTING SYSTEM; George W. Daggett, North Girard, Pa. App. filed Dec. 22, 1915. Control for magneto-supplied lamps.

1,415,179. RADIO-CONTROLLING DEVICE; Edward T. Jones, New Orleans, La. App. filed July 21, 1920. Sending and receiving transfer switch.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

PORTLAND, ME.—A power house will be erected in connection with the proposed packing plant of the Confederated Home Abattoir Company, to cost about $500,000. William F. Gorman heads the company.

BURLINGTON, VT.—Plans have been approved by the Board of Aldermen for the installation of ornamental lamps on Church Street, to be maintained by underground wires. The plans call for forty-two standards, the cost not to exceed $13,000.

BARRE, VT.—The street-lighting committee of the Board of Trade is considering the installation of a new street-lighting system, to be maintained by underground wires.

CHICOPEE, MASS.—The Spalding Manufacturing Company is preparing plans for a power plant at its factory. Jackson & Moreland, 387 Washington Street, Boston, are engineers.

NEW BEDFORD, MASS.—Plans are under consideration for the erection of a double-circuit high-tension transmission line between New Bedford and Fall River, to be built jointly by the New Bedford Gas & Edison Light Company and the Fall River Electric Light Company to provide an interchange of service between the two systems.

NEWBURYPORT, MASS.—The Newburyport Gas & Electric Company has made application to the Department of Public Utilities for permission to issue bonds to the amount of $650,000, part of the proceeds to be used for extension and improvements.

PEABODY, MASS.—The construction of a two-story addition to the power plant at the Danvers Bleachery is reported under consideration.

WEST HARTFORD, CONN.—The Water Board is considering the construction of power plant building.

Middle Atlantic States

BINGHAMTON, N. Y.—The Binghamton Light, Heat & Power Company, Binghamton, has secured a franchise in Conklin and will extend its lines to that town, where a distributing system will be installed. A 40-mile high-tension transmission line will be erected from Johnson City to Sayre, Pa., to connect with the system of the Sayre Electric Company.

BRADFORD, N. Y.—The Niagara, Lockport & Ontario Power Company, Niagara Falls, is negotiating for the property of the Bradford Electric Company. Extensions and improvements are contemplated to the system.

GENESEO, N. Y.—The Livingston Light & Power Company plans to erect substations at Ossian, Dansville and West Sparta, N. Y., with local distributing systems.

KINGSTON, N. Y.—Plans have been completed by the Kingston Gas & Electric Company for improvements to its system, including rebuilding its transmission and distribution system, placing the wires underground on O'Reilly Street and rerouting the high-voltage primary lines from the main street of the city.

MIDDLETOWN, N. Y.—The Orange County Hydro-Electric Company, recently organized, has applied to the Public Service Commission for permission to construct a hydro-electric plant on the Monagaup River to develop an ultimate capacity of 6,585 hp. The company plans to sell energy to the Orange County Public Service Corporation, Middletown, which now serves Middletown, Port Jervis and other communities with electricity.

NEW YORK, N. Y.—The New York Edison Company is planning to erect a substation on East Thirty-second Street, near Madison Avenue, to cost about $200,000 with equipment. William Whitehill, Forty-first Street and Sixth Avenue, is engineer.

NORTH CHILI, N. Y.—The Rochester Gas & Electric Corporation plans to erect a transmission line from Gates Center to North Chili, a distance of 7 miles, to supply electrical service to farmers and residences in that section. A new company has been formed to handle the project. The cost of the extension is estimated at $11,000.

WHEATFIELD, N. Y.—The Walmore Electric Company, Sanborn, recently organized, has applied for franchise to supply electricity in Wheatfield, Niagara and Lewiston. The company is negotiating with the Niagara Falls Power Company for energy. Edward Williams and M. H. Wagner, Wheatfield, head the company.

MILLBURN, N. J.—The Millburn Electric Company will abandon its power plant and will secure power from the New Jersey Power & Light Company, Dover, for distribution. The generating plant will be held for reserve service. New lines will be constructed.

NEWARK, N. J.—Bids will be received by the Board of Education, City Hall, until June 6 for electric lamps and other electrical and mechanical equipment for use in the city schools. R. D. Argue is secretary.

NEWARK, N. J.—The Park Avenue Coal Company, 389-91 Park Avenue, is planning to install three new coal trestles at its yards, which will be equipped for electrical operation.

NEWTON, N. J.—An electrically operated pumping plant will be built on High Street, in connection with extensions and improvements to the waterworks, to cost $246,500. Tribus & Massa, 15 Park Row, New York, are engineers.

TRENTON, N. J.—The Board of Freeholders contemplates installing an electric power plant at the County Workhouse.

VENTNOR, N. J.—An electrically operated pumping plant will be installed in connection with extensions in the municipal waterworks, to cost about $200,000.

ENOLA, PA.—The Pennsylvania Railroad Company will build a power house in connection with its proposed repair shops in Enola, to cost about $500,000.

HARRISBURG, PA.—Bids will soon be asked by the Board of Education for the construction of a one-story power plant, to cost about $150,000. D. D. Hammelbaugh, 121 Chestnut Street, is secretary.

IRONVILLE, PA.—The Farmers' Electric Company, Oxford, will extend its system to Ironville, Silver Spring and Chestnut Hill.

LEWISTON, PA.—The Penn Central Power Company, recently organized, will build a large electric power plant at Saxton, with initial capacity of about 20,000 hp. The company is operated by Day & Zimmerman, Inc., 611 Chestnut Street, Philadelphia.

McCONNELLSBURG, PA.—S. B. Jackson and J. W. Homer, both of Greencastle, are organizing a company to furnish electrical service here. Electricity will be secured from the Kauffman's station of the Chambersburg, Greencastle & Waynesboro Traction Company.

MOWRY, PA.—The Pennsylvania Power & Light Company, Allentown, is planning to rebuild its local substation, recently destroyed by fire.

PHILADELPHIA, PA.—The Philadelphia Electric Company will increase the output of its different generating stations to 336,200 kw. Work will soon commence on a new sub-station at Sixth and Federal Streets.

PHILADELPHIA, PA.—Plans have been filed for the erection of a one-story power house at the plant of the Gotham Silk Hosiery Company, Second and Norris Streets.

READING, PA.—A power house will be erected at the waterworks pumping station, to cost about $60,000.

UNIONTOWN, PA.—The Nicholson Coal Company is planning to rebuild the power house at its Patrick mine, recently destroyed by fire.

WEATHERLY, PA.—The Lehigh Valley Railroad Company will build a steel-tower transmission line from its plant at Ashmore to Weatherly, for power service at its local shops, to replace the present steam plant.

CUMBERLAND, MD.—The Cumberland Edison Power Company, recently organized, has applied to the Public Service Commission for permission to take over the Edison Electric Illuminating Company and the Cumberland Electric Railway Company. Authority has also been asked to issue $450,000, in capital stock, and $1,700,000 in bonds, the proceeds to be used to finance the merger, including extensions and improvements. Thomas B. Finan is president of the new company.

EASTON, MD.—The New Brick & Tile Company, recently organized, will build a power house in connection with its proposed

brick and tile manufacturing plant, to cost about $50,000.

OXFORD, MD.—Bids will be received at the office of the Oxford Utilities Commission until June 1 for furnishing and installing an additional electric generating unit, complete. Separate bids are asked on a 25-hp. Fairbanks-Morse type "Y" alternator, with exciter and switchboard; a 37½-hp. unit and a 50-hp. unit.

WEYER'S CAVE, VA.—The Weyer's Cave Light & Power Company contemplates the installation of a 500-kw. auxiliary oil-engine-driven generating unit.

North Central States

LANSING, MICH.—Preliminary plans are under way for a new industrial and vocational school building at the Industrial School for Boys, Lansing, to cost about $1,000,000. L. W. Fryer, University of Michigan, Ann Arbor, is architect.

ROCHESTER, MICH.—The Council has approved plans for the installation of an ornamental lighting system in the business district.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, Cleveland, until June 2, for ornamental whiteway and parkway lanterns.

OTTAWA, OHIO.—The Paulding Electric Service Company, Defiance, is having plans prepared for local power plant, to cost about $200,000. O. S. Shepfer is president.

PORT CLINTON, OHIO.—The Northwestern Ohio Railway & Power Company, Toledo, will construct a new 22,000-volt transmission line in this district.

DANVILLE, KY.—An addition will be built to power plant at Kentucky School for the Deaf. Augustus Rogers is superintendent.

MORGANFIELD, KY.—The Kentucky Utilities Company, Louisville, is planning to erect a 33,000-volt transmission line from Clay to Morganfield, to cost about $75,000.

WHITESBURG, KY.—The Kentucky & West Virginia Power Company, Hazard, has purchased the property of the W. C. Daniel Light Company, Whitesburg, and will erect a high-tension transmission line from Dalna, via Ice, Whitco, Caudill and Sandlick to Whitesburg. From Whitesburg it is planned to penetrate the main Elkhorn coal fields and on into the Big Sandy Valley. Connection will be made at Pikeville, the center of the Big Sandy Valley, where a large substation will probably be erected. From Pikeville transmission lines will be extended to Welch and Spriggs, W. Va.

DIXON, ILL.—The Illinois Northern Utilities Company contemplates extensions and improvements, including the installation of a 6,000-kw. generator, in its local generating plant, and extending the transmission system to Waukegan to connect with the lines of the Public Service Company of Northern Illinois. The cost is estimated at $500,000.

TAMMS, ILL.—The Tamms Light & Power Company, recently organized, will install a power plant. F. H. Stanton and Charles E. Hinz are interested in the project.

NEW LONDON, WIS.—Plans are being prepared by H. R. Albert, engineer, Green Bay, for the installation of an ornamental lighting system, to consist of from sixty to seventy-five steel standards.

PRAIRIE DU CHIEN, WIS.—F. Heer & Sons, B. & I. Building, Dubuque, Iowa, have been engaged to prepare plans for a new central heating and power plant, for the Campion College, to cost including equipment, about $50,000.

AMES, IOWA.—The Council is considering extensions to the municipal electric plant. P. F. Hopkins is city engineer.

MARSHALLTOWN, IOWA.—The Council contemplates the construction of a municipal hydro-electric plant. Alvord & Burdick, 8 South Dearborn Street, Chicago, are engineers.

LIBERTY, MO.—The installation of a municipal electric plant is under consideration. The Chamber of Commerce is interested in the project.

GROTON, S. D.—A franchise has been granted to the Aberdeen (S. D.) Light & Power Company for light and power service. A transmission line will be erected from Aberdeen to Groton.

BELLEVUE, NEB.—Citizens have approved bonds for $25,000 for extensions and improvements to the electric lighting system.

HUMBOLDT, NEB.—The Cooper Mill & Light Company is planning to rebuild its power plant at once, recently destroyed by fire. The loss is estimated at about $50,000.

LAWRENCE, NEB.—Plans are being prepared for the installation of a municipal electric lighting system, to cost about $13,000. The Hollister Engineering Company, Bankers' Life Building, Lincoln, is engineer.

EMPORIA, KAN.—The Kansas Electric Power Company, Topeka, is planning extensions to its local power plant.

LIBERAL, KAN.—The Council has authorized plans for the construction of a municipal power plant. The Ruckel Engineering Company, Interurban Building, Hutchinson, is engineer.

Southern States

GREENSBORO, N. C.—The Southern Power Company has been ordered by the United States Circuit Court, Richmond, Va., to furnish power to the North Carolina Public Service Company for distribution at Greensboro and High Point, N. C.

EASLEY, S. C.—The Council is considering calling an election to vote on the proposal to issue $75,000 in bonds for improvements to the lighting and water systems and for street improvements.

AUGUSTA, GA.—Plans are under consideration by the Board of City Directors for a municipal hydro-electric plant on Rae's Creek, to cost with transmission and distribution system about $1,000,000. W. P. White and C. D. Carr are members of the board.

JOHNSON CITY, TENN.—The Tennessee Eastern Electric Company will begin work at once on a hydro-electric power plant on the Watauga River, to develop about 5,000 kw., to cost, including transmission line, about $300,000.

NASHVILLE, TENN.—The Hermitage Portland Cement Company, Chattanooga, will establish a power plant in connection with its proposed cement mill, on the Old Hickory property, to cost about $1,500,000.

ROGERSVILLE, TENN.—The Smith-Sanders Power Company contemplates the construction of a hydro-electric plant on the Holston River in Hawkins County.

FORT SMITH, ARK.—The Mississippi Valley Power Company, recently organized, with a capital stock of $1,700,000, will take over the property and holdings of the Commonwealth Public Service Company. Extensions and improvements are contemplated. D. C. Green is president.

RUSSELLVILLE, ARK.—The Council is considering a bond issue of $250,000 for the construction of a municipal electric plant.

DE QUINCY, LA.—The Chamber of Commerce is making surveys for the installation of a new lighting system in all parts of the city.

NEW ORLEANS, LA.—Bids will be received by the Sewerage and Water Board of New Orleans until July 19 for furnishing one 6,000-kw. turbine and accessories. George G. Earl is general superintendent.

PLAQUEMINE, LA.—Plans are being prepared for improvements to the municipal electric light plant and waterworks system, to cost about $150,000. Swanson-McGraw, Inc., United Fruit Building, New Orleans, is engineer.

DUNCAN, OKLA.—A. L. Mullergren, Gates Building, Kansas City, Mo., has been engaged to prepare plans for the installation of an electric distribut'ng system, in Duncan, to cost about $80,000.

FAIRLAND, OKLA.—The Council will receive bids until June 20 for the construction of a transmission line. H. G. Olmstead & Company, Tradesmen's National Bank Building, Oklahoma City, are engineers.

GAGE, OKLA.—The Council will receive bids until June 1 for extensions to the electric system, including the installation of two 100-hp. oil engines. H. G. Olmstead & Company, Tradesmen's National Bank Building, Oklahoma City, are engineers.

MUSKOGEE, OKLA.—The Royal D. Salisbury Company, 233 Broadway, New York, engineer, has tentative plans under consideration for the construction of a hydro-electric generating plant on the Grand River, to develop about 125,000 hp.

OKEENE, OKLA.—The Council will receive bids until June 1 for extensions and improvements in the municipal power plant and system to cost about $40,000. V. V. Long & Company, Colcord Building, Oklahoma City, Okla., are engineers.

CORPUS CHRISTI, TEX.—The Gulf Coast Power Company contemplates extensions and improvements to its power plant, to cost about $50,000.

FORT WORTH, TEX.—The Lighting Department is considering the installation of an ornamental lighting system on several streets in the city. R. A. Hunter is light commissioner.

TEXAS CITY, TEX.—The United States-Mexican Oil Corporation will build a power plant in connection with its new oil distributing works on the dock property leased from the Texas City Terminal Company.

Pacific and Mountain States

CARLISLE, WASH.—The Carlisle-Pennell Lumber Company is planning to equip its plant throughout for electrical operation, including a new Monorail conveying system, to cost about $250,000.

OLYMPIA, WASH.—The city lighting committee has been authorized to call for bids for the installation of an ornamental lighting system in the business district. Service will be furnished by the Olympia Light & Power Company.

SPOKANE, WASH.—Arrangements have been completed by the Washington Water Company for lighting the towns of Ephrata, Wilson Creek, Marlin, Adrian, Stratford and Neppel, which will require the erection of a 14-mile 13,000-volt transmission line from Stratford to Marlin. The company has taken over the plant in Wilson Creek, which will be dismantled.

WALLA WALLA, WASH.—The Water Commission will make surveys for the construction of a municipal hydro-electric plant.

BAKERSFIELD, CAL.—Plans are being prepared by the Di Giorgio Farms Company for a new ice-manufacturing, refrigerating and pre-cooling plant, to cost about $1,200,000.

FULLERTON, CAL.—The Board of Education is preparing plans for the erection of a new power plant at the Union High School, to cost about $100,000. Carleton M. Winslow, Van Nuys Building, Los Angeles, is architect.

HEMET, CAL.—The Lake Hemet Water Company has applied to the State Water Commission for permission to construct a hydro-electric plant on Strawberry Creek, to develop 5,200 hp.

LOS ANGELES, CAL.—The Public Service Commission is preparing plans for a power house on the San Fernando Road, to cost about $90,000.

RIVERSIDE, CAL.—The Southern Sierras Power Company has been granted permission by the State Water Commission to construct a hydro-electric plant on Snow Creek, to develop 12,350 hp. Another plant will be built later in the same vicinity with capacity of 5,500 hp.

SACRAMENTO, CAL.—Surveys will be made by the City Engineering Department for the construction of three municipal hydro-electric plants in the Silver Creek section, about 60 miles from the city, to develop about 100,000 hp. The cost, including transmission system, is estimated at about $5,000,000. Albert Given is city engineer.

BONNERS FERRY, IDAHO.—Work will soon begin on the construction of a new municipal hydro-electric plant at Moyie Falls, to develop about 550 hp. H. H. Hughes is manager of the municipal electric water and light department.

ARRIBA, COL.—E. A. Brown, 715 Minnesota Avenue, Kansas City, Kan., has been awarded a contract to erect a transmission line to Flagler, about 10 miles. W. B. Rollins & Company, Railway Exchange Building, Kansas City, Mo., are engineers.

DENVER, COL.—The Denver Gas & Electric Company contemplates the construction of a hydro-electric plant on Grand River, near Kremling, with an initial capacity of 57,000 hp.

PUEBLO, COL.—The Southern Colorado Power Company has been organized to take over the plants and property of the Arkansas Valley Railway, Light & Power Company.

Canada

DRUMHELLER, ALTA.—Steps have been taken by the Drumheller Land Company to replace the generator in the power plant at the Callie Mine, recently destroyed by fire.

HANNA, ALTA.—The Town Council is considering the establishment of a municipal electric light plant.

ST. JOHN, N. B.—The Council has adopted a resolution authorizing a bond issue of $900,000 for the installation of a civic hydro-electric distribution system.

NIAGARA FALLS, ONT.—The installation of five additional generating units at the Queenston power station, to develop from 250,000 hp. to 300,000 hp., is under consideration by the Hydro-Electric Power Commission of Ontario.